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The

Tropical Agriculturist

APRIL TO JUNE, 1950

EDITORIAL

Crop Yields

IN the campaign to increase the production of food in Ceylon, attention naturally focuses on the yields obtained from our paddy fields. Official estimates give a depressingly law average figure, probably the lowest for any rice-growing country in the world. There are some, however, who for various reasons are unable to accept quite such a pessimistic view. There are many factors to be considered in arriving at any estimate of average yields. It must be clearly stated on what the estimate is based, whether total acreage available for cropping with paddy (total area *asweddumized*) or the actual acreage sown in any one season. These figures may be widely different particularly where the sown area depends on a precarious rainfall as in most of the lands irrigated from minor tanks. If such unsown areas are included as having zero yields the average is seriously depressed. Again, if a crop is sown but fails for one reason or another, drought or flood, should it be included or excluded from the area counted as cropped? And what constitutes a failure? Is it to be a zero yield or a yield some fixed degree below the normal, such as one-third or less? If so, what is to be considered the normal and how is it to be decided, remembering the seasonal variations? If all these points are settled then, what about the area of the bunds? Shall they be included in acreage or not? They are part of the field in the sense that the owner of the field owns the bunds as well but they give a zero paddy yield themselves even though they contribute indirectly to the crop. The area of the bunds is by no means negligible where plots are small, as they commonly are in Ceylon.

The practice followed in Ceylon in arriving at a yield seems to lend itself towards arriving at a minimum. The area has been the gross area suitable for cropping; it makes no allowance as in some countries, *e.g.*,

India, for fallows or areas sown but destroyed, and it includes bunds. The gross outturn is a guess estimate compiled by adding up a series of estimates, themselves guesses, made by a number of minor officials who get most of their information from the farmers themselves. These, being in fear of the tax collector and of revealing to the landlord the amount he could claim as his share, inevitably underestimate yields. The nett result is an inflated acreage figure and a depressed outturn estimate combining to give a low average figure for yield per acre.

The paper in this number by Chandraratna gives the results of the first attempt to conduct a yield survey in Ceylon on lines based on the most modern statistical technique. It was an experiment and must be regarded as such. It set out to test a method rather than to acquire information on Ceylon's paddy yields and it has given most valuable technical information for future planning. The lack of precise knowledge of the amount of food produced and of the localities where the greatest improvements in existing practices are needed or possible is a hindrance in the food production campaign. The present pilot survey, which not only gives yield figures of a stated degree of reliability but also includes a wealth of additional information on cultural practices and the adoption of good husbandry methods, is of great value. If such a survey could be made to cover the whole Island it would show where the " bad spots " are, where the cultivation methods are most in need of improvement, where fertilizers might do the most good and, if repeated would estimate the degree of improvements effected as a result of technical advice and propaganda.

It has been repeatedly shown that, given a reasonable chance the soils of Ceylon are generally capable of giving good yields. In fact, test-harvested plots have on several occasions given yields which are so phenomenal as to be scarcely credible. To be told of a yield of 190 bushels from an acre is putting a strain on one's sense of trust which it can scarcely sustain, and would not, were the evidence not well supported by crop cutting figures. In such a case, one inevitably thinks of the classical classification of falsehood into lies, damned lies and statistics. But even disposing of the freak plot as unworthy of credence one still has to face the case where somebody has " tried every improvement " and not only records an enormous yield but actually enters it in the farm stock register, thereby becoming financially responsible for its existence. It is beyond doubt that Ceylon yields can at times be extremely good and it is worth considering under what conditions such yields occur.

There is no doubt that when a very high yield is obtained it is a result of a combination of factors or rather an integration of a number of production factors. The best yields do not come from the adoption of any single production factor alone though undoubtedly some can individually give substantial increases. It may even happen that a practice, good in itself, may depress yield if other conditions are adverse. For example, a selected variety (pure line) may perform badly if the growing conditions it needs are absent and to put a quick-acting fertilizer on a weedy field may only improve the weeds. A phosphate dressing used alone may give little or no increase but combined with nitrogen and good husbandry the result may be startling. In the Corn Belt of America the integration of several

factors rather than the application of a single factor has led to greatly increased yields, though it may be remarked that this change in approach has only come in the last decade, even in that progressive country.

Granted that great improvements in yields of paddy in Ceylon are generally possible what are the reasons which hinder their achievement? The methods are known and amply proved but " known " applies to a few technicians and favoured farmers. The general mass is not yet able to understand what is needed or is fearful of changing age-old practices. Sometimes there is a local difficulty or it is the share-cropper's dislike of seeing his landlord gain by his efforts, but most widely it is lack of knowledge and lack of faith in the technical officers' advice. Only by slow and persistent demonstration can these difficulties be overcome.

The farmer has many difficulties to face which are not always well understood. He is by nature cautious and generally pessimistic; he has all nature and Man besides to contend with. His reactions to an improvement, obvious to the technician, are sometimes surprising. The farmer who complained that the increased yield from improved methods he had adopted was an embarrassment was not wholly facetious. The heavy yield on his somewhat larger-than-average holding needed an extra hand to reap and thresh it, and in addition it delayed the completion of threshing by a couple of weeks, so postponing his sale of the crop and repayment of advances taken during the growing season, thereby entailing additional interest quences of a drive otherwise reasoable in all respects. Such economic payments! These are unexpected but not unreasonable economic conse-quandaries commonly settle themselves but the unexpected repercussions of an otherwise desirable result illustrate the complexities which can arise from a disturbance of a longstanding situation. It also illustrates the fact that not only must there be an integration of technical improvements in crop husbandry but a concomitant adjustment of economic factors.

Report on a Random Sample Survey of Paddy Yields in the Kandy, Kegalla and Ratnapura Districts

M. F. CHANDRARATNA,

BOTANIST AND SENIOR AGRICULTURAL RESEARCH OFFICER.

UP to the time that the survey reported herein was undertaken, a valid estimate by a statistically satisfactory method, of the acre yield in a paddy tract, had not been attempted in this country. Traditional estimates have been extremely low, and the statement that Ceylon yields are among the lowest in the world is common. The low estimate that the peasant usually provides of the yield of his fields, has been blamed on various factors including the share system of tenancy and the belief in the evil eye. The validity of available estimates has often been questioned, and the need for checking on their accuracy by a random sampling method has been frequently urged. At the request of the Director of Census and Statistics, a pilot survey aimed partly at securing yield estimates, and partly at developing sampling methods suitable for subsequent island-wide use, was undertaken in the *yala* season, 1949. The survey covered a total extent of 48,652 acres of cultivated paddy, and included the whole of the Kegalla and Kandy Districts, and 57 per cent. of the paddy acreage in the Ratnapura District.

DESIGN AND METHODS

Multi-stage sampling without weightage for extent was used. First-stage sampling was stratified. It was convenient for purposes of organisation. and equitable from the point of view of division of labour, to treat Agricultural Instructors' ranges as strata. Moreover, as the ranges represent different soil and climatic types, it was expected that stratification would contribute to precision. Each range consists of one or more korales. The stratification and the acreages of cultivated paddy in the *yala* season, 1949, in the area covered by the survey are given in Table 1. Acreage figures were derived by the method of complete enumeration by the Department of Census and Statistics, and possess a high degree of accuracy.

Within each stratum, viz., each Agricultural Instructor's range, nineteen random Village Headmen's Divisions were selected. The 1945-1946 Census list published by the Department of Census and Statistics, formed the frame from which the random Village Headmen's Divisions were drawn. Two random kumburas were selected within each Village Headman's Division. A single random 1/403 acre (18 ft. × 6 ft.) plot was cut from each kumbura.

The plot size in crop-cutting surveys has been the subject of much controversy. In England and the U.S.A., diminutive plots are used. Indian statisticians, except Prof. P. C. Mahalanobis, however, favour the use of plots of considerable size, e.g., 1/10 acre plots for cotton, and 1/20—1/80 acre plots for paddy. In the area under survey, the frequent occurrence on terraced land of narrow liyaddes prevents the use of large, isodiametric plots. It has been agued that the relatively large perimeter of small plots may lead to over-estimation of yields, and it was with much misgiving that I committed myself to a plot size of 1/403 acre in the instance of the present survey. Plots of this size are not recommended for general adoption in an island-wide survey, and their use should be restricted to areas where large plots are not possible.

Appendix 1 reproduces the detailed instructions distributed to all Agricultural Instructors participating in the survey, on the procedure for demarcating and harvesting a random plot in each kumbura. Schedule A mentioned in Appendix 1 is attached. This schedule elicits information

TABLE I

Districts		*Agricultural Instructors' Ranges*		*Korales*	
Name	*Acreage under Paddy*	*Name*	*Acreage under Paddy*	*Name*	*Acreage under Paddy*
Kandy	23,528	Yatinuwara	3,145	Yatinuwara, Udunuwara	2,825
				Kandy Gravets	320
		Harispattuwa	5,826	Harispattuwa	3,530
				Tumpane	2,296
		Dumbara	10,421	Pata Dumbara	4,686
				Uda Dumbara	5,735
		Pata Hewaheta	1,772	Pata Hewaheta	1,772
		Uda Bulatgama	2,364	Uda Bulatgama	92
				Uda Palata	2,272
Kegalla	15,420	Galboda-Kinigoda	6,714	Galboda-Kinigoda	6,714
		Paranakuru	4,920	Paranakuru	4,920
		Beligal	1,774	Beligal	1,774
		Lower Bulatgama	2,012	Lower Bulatgama and Dehigampal	1,027
				Atulugam and Panawal	985
Ratnapura	9,704	Kuruwita	4,400	Kuruwita	4,400
		Nawadun	5,304	Nawadun	5,304
Total	48,652		—		—

on prevailing cultural and manurial practices and on varieties grown. Instructions and questionnaires owe much to those issued by Dr. P. V. Sukatme, Statistical Adviser, Indian Council of Agricultural Research, New Delhi. Before the commencement of the survey I held three rehearsals which the Divisional Agricultural Officer, Central, his Senior Assistant and Agricultural Instructors concerned in the survey attended.

Each randomly selected kumbura was inspected by the Agricultural Instructor responsible, on a date well ahead of harvesting. On this occasion, the cultivator's consent to the use of his kumbura in the survey was secured, and the date of harvesting was tentatively agreed on. Any change in the harvesting date was to be communicated by the cultivator to the Instructor. The periods over which harvesting of plots proceeded in the various ranges are given below :

Range	*Period of Harvesting of Plots*
Yatinuwara ..	July 26 —August 31
Harispattuwa ..	August 20 —October 30
Dumbara	August 8 —November 25
Pata Hewaheta ..	July 26 —October 5
Uda Bulatgama ..	July 17 —September 6
Galboda-Kinigoda ..	August 9 —September 14
Paranakuru ..	August 10 —October 5
Beligal	August 1 —September 11
Lower Bulatgama ..	July 17 —September 13
Kuruwita	August 2 —September 22
Nawadun	August 12 —November 3

Yala harvest in the Dumbara range extended into late November.

The samples of stalk paddy received at the Botanist's Station, Katugastota, were threshed, winnowed, cleaned, sun-dried for fourteen days and weighed. The survey provided a rare collection of land races of paddy which were retained by me; equivalent quantities of consumption paddy were returned to cultivators.

The season of the survey showed no striking deviation from normality in the instance of the Kandy District and in the Eastern half of the Ratnapura District. *Yala* 1949 precipitation in the Kegalla District and in the Western half of the Ratnapura District was above normal. A table of deviations from normal rainfall is given in Appendix 2.

RESULTS

Yield per Acre.—The estimation of the mean yield per acre for the area covered was the primary object of the survey. The mean acre yields of paddy for the eleven strata were calculated, and are listed in column three of Table 2. Standard errors providing a measure of the variation between Village Headmen's Divisions within a stratum are given in column four. The figure for total output in the last column of the table is derived from the product of the acreage and the mean acre yield. Stratum yields weighted for acreage and aggregated districtwise and for the whole area surveyed, are also presented.

The weighted mean yield for the whole area covered by the survey was 27 bushels* of paddy per acre. This figure has a standard error of $2\frac{1}{2}$ per cent., and has accordingly high precision. The exact meaning of an acre-yield figure of 27 bushels with a $2\frac{1}{2}$ per cent. standard error should be made clear: this estimate implies a 95 per cent. certainty that the true yield of the area surveyed cannot be less than $25\frac{1}{2}$ bushels per acre, and cannot exceed $28\frac{1}{2}$ bushels per acre.

TABLE 2.—Acre Yields and Total Production of Paddy

District	*Agricultural Instructor's Range*	*Mean Yield of Paddy in Bushels per Acre*	*Standard Error*	*Percentage Standard Error*	*Acreage under Paddy*	*Total Production of Paddy in Bushels*
Kandy	Yatinuwara	27·8	±1·5	±5·4	3,145	87,431
	Harispattuwa	29·3	±1·8	±6·1	5,826	170,702
	Dumbara	30·5	±2·3	±7·5	10,421	317,841
	Pata Hewaheta	41·0	±2·3	±5·6	1,772	72,652
	Uda Bulathgama	26·7	±2·4	±9·0	2,364	63,119
	District Total	30·2	—	—	23,528	710,546
Kegalla	Galboda-Kinigoda	30·6	±1·6	±5·2	6,714	205,448
	Paranakuru	26·7	±1·8	±6·7	4,920	131,364
	Beligal	23·6	±2·0	±8·5	1,774	41,866
	Lower Bulathgama	21·5	±1·5	±7·0	2,012	43,258
	District Total	27·4	—	—	15,420	422,508
Ratnapura	Kuruwita	18·3	±2·2	±12·0	4,400	80,520
	Nawadun	21·5	±1·1	±5·1	5,304	114,036
	District Total	20·1	—	—	9,704	195,050
Total for whole area surveyed		27·3	±0·7	±2·5	48,652	1,328,200

It should be noted that the estimate of 27 bushels per acre is for the early varieties grown in the *yala* season. The long-aged varieties grown in *maha* would give a strikingly higher yield.

The Kandy and Kegalla Districts have mean yields of 30 and 27 bushels per acre respectively. Yields within the Kandy District are uniformly high. The Pata Hewaheta Korale with an acre yield of 41 bushels tops the list of strata composing the survey. All the strata in the Kandy District have yields of over 26 bushels per acre. That fraction of the Ratnapura District included in the survey has an average yield of 20 bushels per acre.

The discrepancy between these objectively derived figures and published ' guesstimates ' is startling. The figures of acre yields, based on harvested acreages, for the Central and Sabaragamuwa Provinces, for *yala* 1948, provided in the ' Statistical Abstract of Ceylon, 1949 ', are 14.0 and 12.3 bushels per acre respectively.

*A bushel weight of 46 lb. paddy is assumed.

Statistical Analyses of Results.—The stratumwise and pooled analyses of variance of yields are given in Table 3. These variance analyses provide data that guide the choice of sampling technique in future surveys. The following equation relates the standard error of the mean yield to the number of Village Headmen's Divisions, the number of kumburas per Village Headman's Division and the number of plots per kumbura :

$$V(\bar{x}) = \frac{V_1}{d} + \frac{V_2}{dk} + \frac{V_3}{dkp}$$

TABLE 3.—Analyses of Variance of Yields

	Between VH Divisions			*Between Kumburas*		
	DF	*SS*	*MS*	*DF*	*SS*	*MS*
Yatinuwara	18	3321615	184534·2	19	2389150	125744·7
Harispattuwa	18	4497973	249887·4	19	2550286	134225·6
Dumbara	18	7812456	434025·3	19	5424257	285487·2
Pata Hawaheta	18	7763515	431306·4	19	4119108	216795·2
Uda Bulatgama	18	8086722	449262·3*	19	3507251	184592·2
Galboda Kinigoda	18	3798750	211041·7	19	3160510	166342·6
Paranakuru	18	4673234	259624·1	19	2956616	155611·4
Beligal	18	5990064	332781·3*	19	2715095	142899·7
Lower Bulatgama	19	3066924	170384·7	19	3737052	196686·9
Kuruwita	18	6898495	383249·7†	19	1490017	78421·9
Nawadun	18	1662815	92378·6	19	3449428	181548·8
Total	198	57572563	290770·5	209	35498770	169850·6

* Significant at five per cent. point.
† Significant at one per cent. point.

where $V(\bar{x})$ is the variance of the mean yield, V_1, V_2 and V_3 are the true variances attributable to Village Headmen's Divisions, kumburas and plots respectively, and d, k and p are the numbers of Village Headmen's Divisions, kumburas and plots respectively. The estimates of numbers of Village Headmen's Divisions needed for securing standard errors of one to five per cent. obtained by solving the above equation with the appropriate values from the pooled variance analyses, are given in Table 4.

Manurial Practices.—Information regarding the use of manures is summarized in Table 5. Forty-six per cent. of the fields in the Kegalla District, and 31 per cent. of the fields in the Kandy District received no manure of any kind. In the Ratnapura District (Kuruwita and Nawadun Korales), on the other hand, the percentage of unmanured fields is only about 4 per cent. The only manure used in the Kuruwita and Nawadun Korales is bonemeal; every sampled kumbura in the Kuruwita Korale, and 89 per cent. of the kumburas in the Nawadun Korale, had received a dressing of bonemeal. The popularity of bonemeal declines as one proceeds to the higher elevations : the percentages of fields that had received bonemeal in the Kegalla and Kandy Districts were 51 and 20 respectively. The extensive use of bonemeal in the Kuruwita, Nawadun and Lower Bulatgama and Dehigampal Korales does not appear to have benefited yields markedly, the yields of these korales are the lowest in the area under survey. The apparently poor response to bonemeal may be due to the fact that it has

invariably been applied alone. Inclusion of bulky organics would have improved the response.

Bonemeal is the only fertilizer used in the area covered by the survey. Cultivators either have been unable to secure or afford supplies of ammonium sulphate and phosphates, or have not heeded Departmental advice.

TABLE 4.—Numbers of V. H. Divisions needed to secure Standard Errors of Various Magnitudes

Number of Kumburas per V. H. Division	*Standard Error of Mean Yield*				
	One per cent.	*Two per cent.*	*Three per cent.*	*Four per cent.*	*Five per cent.*
1	1461	365	163	92	59
2	922	231	103	58	37
3	743	186	83	47	30
4	653	164	73	41	27
5	599	150	67	38	24
6	563	141	63	36	23

The use of farmyard manure and compost is not common in any of the Districts. Green manuring is, however, frequently practised in the Kandy District. The extensive adoption of green manuring may have contributed to the high yield (41 bushels per acre) in the Pata Hewaheta Korale.

Cultural Practices.—Only 3 per cent. of the acreage cultivated in *yala* had been fallow the previous *maha*. This does not necessarily imply that cultivation of the same land in both seasons is general; an appreciable extent of the land planted in long-aged varieties in *maha* is left fallow in *yala*.

Only 2 per cent. of the fields had been transplanted. The short age of the varieties grown in *yala* explains the reluctance to transplant.

Table 6 presents data relating to the practice of weeding. Only 32 per cent. of the fields in the whole area had been weeded. The prevalence of the practice varies markedly between strata. Pata Hewaheta was outstanding in that the percentage of weeded fields was as high as 88 per cent. No weeding appears to have been practised at all in Yatinuwara. Kuruwita with a weeded percentage of eight is almost as bad. The high yield of Pata Hewaheta fields and the poor yield in the Kuruwita Korale may be partly connected with differences in weed infestation.

Table 7 classifies fields on the basis of the implements used in tillage, viz., the plough and the mamoty. Ploughed and mamotied land may or may not be buffalo mudded. The popularity of the plough in the Kandy District, where 92 per cent. of the fields are ploughed, and its infrequent use in the Ratnapura District (Kuruwita and Nawadun Korales) may be indicative of differences in cultivation standards. It is significant that in Pata Hewaheta, the korale that is pre-eminent in the matter of yield, no kumbura is worked with a mamoty. In the Kuruwita and Nawadun Korales, even the peasant who aims at higher cultivation standards may not find the use of the plough possible in some of the deeper swamps in these tracts.

TABLE 5.—Use of Manures in Area under Survey

District	Agricultural Instructor's Range	No Manure		Farmyard Manure or Compost		Green manure		Bonemeal		Farmyard Manure or Compost + Green Manure		Farmyard Manure or Compost + Bonemeal		Green manure + Bonemeal		Farmyard Manure or Compost + Green Manure + Bonemeal		Miscellaneous Manures	
		No. of kumburas	Per cent.	No. of kumburas	Per cent.	No. of kumburas	Per cent.	No. of kumburas	Per cent.	No. of kumburas	Per cent.	No. of kumburas	Per cent.	No. of kumburas	Per cent.	No. of kumburas	Per cent.	No. of kumburas	Per cent.
Kandy	Yatinuwara ..	21	55·2	4	10·5	6	15·8	2	5·3	1	2·6	—	—	3	8·0	1	2·6	—	—
	Harispattuwa ..	12	31·6	—	—	9	23·7	16	42·1	—	—	—	—	1	2·6	—	—	—	—
	Dumbara ..	17	44·7	3	7·9	5	13·1	8	21·0	1	2·6	1	2·6	2	5·2	1	2·6	—	—
	Pata Hewaheta ..	1	2·6	3	7·9	24	63·1	1	2·6	5	13·1	—	—	2	5·2	1	2·6	1	2·6
	Uda Bulatgama ..	7	18·4	6	15·8	2	5·2	—	—	3	8·0	—	—	—	—	—	—	20	52·6
	District total ..	58	30·5	16	8·4	46	24·2	27	14.2	10	5·3	1	0·5	8	4·2	3	1·5	21	11·0
Kegalla	Galboda-Kinigoda ..	23	60·5	2	5·2	—	—	11	28·9	—	—	—	—	1	2·6	1	2·6	—	—
	Paranakuru ..	17	44·7	—	—	—	—	19	50·0	—	—	1	2·6	—	—	—	—	1	2·6
	Beligal ..	29	76·3	—	—	—	—	9	23·7	—	—	—	—	—	—	—	—	—	—
	Lower Bulatgama ..	1	2·6	—	—	1	2·6	34	89·4	—	—	2	5·2	—	—	—	—	—	—
	District total ..	70	46·2	2	1·3	1	0·7	73	48·2	—	—	3	2·0	1	0·7	1	0·7	1	0·7
Ratnapura	Kuruwita ..	—	—	—	—	—	—	36	94·7	—	—	2	5·2	—	—	—	—	—	—
	Nawadun ..	3	7·9	—	—	1	2·6	33	86·8	—	—	1	2·6	—	—	—	—	—	—
	District total ..	3	4·0	—	—	1	1·3	69	90·7	—	—	3	4·0	—	—	—	—	—	—
	Total for whole Area surveyed	131	31·4	18	4·3	48	11·5	169	40·5	10	2·4	7	1·6	9	2·1	4	1·0	22	5·3

TABLE 6—Numbers of Weeded and Unweeded Kumburas

District	Agricultural Instructor's Range	Weeded		Unweeded	
		No. of Kumburas	Per Cent.	No. of Kumburas	Per Cent.
Kandy	Yatinuwara	0	0·0	38	100·0
	Harispattu	13	34·3	25	65·7
	Dumbara	8	21·1	30	78·9
	Pata Hewaheta	28	87·5	4	12·5
	Uda Bulatgama	15	39·4	23	60·6
	District Total	64	35·2	120	64·8
Kegalla	Galboda-Kinigoda	10	26·3	28	73·7
	Paranakuru	8	21·1	30	78·9
	Beligal	16	45·7	19	54·3
	Lower Bulatgama	15	39·4	23	60·6
	District Total	49	33·0	100	67·0
Ratnapura	Kuruwita	3	7·9	35	92·1
	Nawadun	15	39·4	23	60·6
	District Total	18	23·4	58	76·6
Total for whole area surveyed		131	32·0	278	68·0

TABLE 7—Numbers of Ploughed and Mamotied Kumburas

District	Agricultural Instructor's Range	Ploughed		Mamotied	
		No. of Kumburas	Per Cent.	No. of Kumburas	Per Cent.
Kandy	Yatinuwara	28	73·7	10	26·3
	Harispattuwa	37	97·4	1	2·6
	Dumbara	38	100·0	0	0·0
	Pata Hewaheta	38	100·0	0	0·0
	Uda Bulatgama	33	86·9	5	13·1
	District Total	174	91·5	16	8·5
Kegalla	Galboda-Kinigoda	37	97·4	1	2·6
	Paranakuru	36	94·6	2	5·4
	Beligal	36	94·6	2	5·4
	Lower Bulatgama	19	50·0	19	50·0
	District Total	128	84·5	24	15·5

District	Agricultural Instructor's Range	Ploughed		Mamotied	
		No. of Kumburas	Per Cent.	No. of Kumburas	Per Cent.
Ratnapura ..	Kuruwita ..	6 ..	21·8 ..	32 ..	78·2
	Nawadun ..	8 ..	21·1 ..	30 ..	78·9
	District Total ..	14	18·5	62	81·5
Total for whole area surveyed ..		316	79·0	83	21·0

Fifty-seven per cent. of the fields in the area covered by the survey were completely rain-fed. In the Paranakuru Korale, every kumbura surveyed was rain-fed. The lack of an assured water supply has an important bearing on (*a*) the choice of variety, and (*b*) the allocation of fertilizers. Varieties grown in areas where the water supply is precarious, should possess some measure of drought resistance. Available fertilizer supplies should be concentrated on irrigated tracts, where response is guaranteed, and should be released in quantity to rain-fed areas only when a surplus exists.

Varieties.—Table 8 provides a frequency distribution of the age classes of varieties grown in the area covered by the survey. Sixty-eight per cent. of the varieties had a sowing-to-harvest age of four months; 15 per cent. exceeded this age, and 17 per cent. were shorter aged than four months. Generally speaking, the Ratnapura District grew the longest aged varieties, and the Kegalla District grew the earliest.

Table 9 lists the varieties grown in the area under survey. It should be noted that a number of distinct varieties may be included under one name, and that a single variety may masquerade under numerous names. The Table, however, indicates striking regional preferences. In the Kandy District, *Heenati* predominates. The Kegalla District prefers *Madael*, a variety which, as its name implies, is suitable for ill-drained land; the Beligal Korale grows *Madael* almost to the complete exclusion of all other varieties.

Under 3 per cent. of the fields in the whole area surveyed, carried purelines. Not a single field in the Kegalla District carried a pure line. These depressing facts must be due to one of the following causes: (1) the non-existence of suitable purelines, (2) the failure of extension work to impress the peasant, and (3) the defective functioning of the organisation for seed multiplication and issue. It is admittedly difficult to cover an area like the one under survey, where marked variations in soil and climate occur over relatively short distances with one or two pure lines, but the widely-adaptable *Vellai ilankalayan* should suit the better-drained soils and *Suduheenati* ICPY-15 may be recommended for swamps

TABLE 8.—Age Classes of Varieties

District	Agricultural Instructor's Range	Age Classes of Paddy Varieties: 3 Months — No. of Kumburas	3 Months — Per Cent.	3½ Months — No. of Kumburas	3½ Months — Per Cent.	4 Months — No. of Kumburas	4 Months — Per Cent.	4½ Months — No. of Kumburas	4½ Months — Per Cent.	5 Months — No. of Kumburas	5 Months — Per Cent.
Kandy	Yatinuwara	1	2·6	3	7·9	34	89·5	0	0·0	0	0·0
	Harispattuwa	2	5·3	0	0·0	30	78·9	6	15·8	0	0·0
	Dumbara	8	21·2	10	26·3	15	39·4	5	13·1	0	0·0
	Pata Hewaheta	5	13·1	0	0·0	25	65·9	7	18·4	1	2·6
	Uda Bulatgama	1	2·6	2	5·3	26	68·4	7	18·4	2	5·3
	District Total	17	9·0	15	7·9	130	68·4	25	13·1	3	1·6
Kegalla	Galboda-Kinigoda	10	26·3	7	18·4	21	55·3	0	0·0	0	0·0
	Paranakuru	9	23·7	0	0·0	29	76·3	0	0·0	0	0·0
	Beligal	1	2·6	0	0·0	37	97·4	0	0·0	0	0·0
	Lower Bulatgama	2	5·3	3	7·9	29	76·3	4	10·5	0	0·0
	District Total	22	14·5	10	6·6	116	76·6	4	2·3	0	0·0
Ratnapura	Kuruwita	5	13·1	0	0·0	17	44·5	8	21·2	8	21·2
	Nawadun	1	2·6	1	2·6	22	58·0	9	23·7	5	13·1
	District Total	6	7·9	1	1·3	39	51·5	17	22·4	13	16·9
Total for whole area surveyed		45	10·8	26	6·2	285	68·2	46	11·0	16	3·8

TABLE 9.—Distribution of Varieties in Area under Survey

District	Agricultural Instructor's Range	Halleli	Hatiel	Heenati	Hetadawi	Honderawala	Kahamalan	Kaharamana	Kaluheenati	Kalukunda	Kiriel	Kirinaran	Kottiyaran	Madael	Madatowalu	Mudukiriyal	Murunga	Pachchaiperumal	Podiratawi	Rambutan	Rathkunda	Samba	Suduheenati	Sudumandiran	Suduruwi	Suduwi	Sulai	Tawalu	Vellai Ilankalayan
		Names of Varieties Grown																											
Kandy	Yatinuwara	—	—	15	—	—	—	—	11	—	—	—	3	4	—	—	—	—	—	—	—	—	5	—	—	—	—	—	—
	Harispattuwa	—	—	24	—	—	—	—	3	—	—	—	1	—	—	8	1	—	—	—	—	—	1	—	—	—	—	—	—
	Dumbara	—	—	20	—	—	1	—	—	—	—	—	4	—	—	—	3	2	—	—	2	—	6	—	—	—	—	—	—
	Pata Hewaheta	—	—	5	—	1	—	—	—	1	—	—	—	—	—	1	—	4	—	—	18	—	3	—	1	1	1	—	2
	Uda Bulatgama	—	—	8	—	—	—	—	7	—	—	—	3	2	—	1	—	—	—	—	—	—	11	—	—	1	—	—	5
	District Total	—	—	72	—	1	1	—	21	1	—	—	11	6	—	10	4	6	—	—	20	—	26	—	1	2	1	—	7
Kegalla	Galboda-Kinigoda	—	—	6	—	—	—	—	3	—	—	—	10	17	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—
	Paranakuru	—	—	1	—	—	—	—	3	—	1	—	9	20	—	1	—	—	—	—	—	—	3	—	—	—	—	—	—
	Beligal	—	—	1	1	—	—	—	—	—	—	—	—	37	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Lower Bulatgama	—	1	7	1	—	—	—	—	9	—	1	4	6	4	—	—	—	—	—	—	—	—	—	—	—	—	4	—
	District Total	—	1	15	2	—	—	—	6	9	1	1	23	80	4	3	—	—	—	—	—	—	3	—	—	—	—	4	—
Ratnapura	Kuruwita	—	—	—	5	—	—	1	—	1	—	1	—	—	2	—	—	—	1	1	—	1	—	—	—	4	10	10	—
	Nawadun	6	—	—	—	—	—	—	1	3	—	4	—	—	9	—	3	—	—	—	—	—	—	1	—	4	—	4	2
	District Total	6	—	—	5	—	—	1	1	4	—	5	1	—	11	—	3	—	1	1	—	1	—	1	—	8	10	14	2
	Total for whole Area surveyed	6	1	87	7	1	1	1	27	14	1	6	35	86	15	13	7	6	1	1	20	1	29	1	1	10	11	18	9

Drainage.—Table 10 classifies fields on the basis of the degree of drainage. The proportion of ill-drained fields is particularly high in the Uda-Bulatgama, Lower Bulatgama and Nawadun Ranges.

System of Tenure.—In Table 11, the fields included in the survey are classified according to the system of tenure. Two broad classes are recognized, viz., fields cultivated by owners and by tenants. Temple lands worked by tenants under the system of *rajakariya* are treated as owner-cultivated holdings; tenants under this system enjoy a high degree of permanency and pay no share rental. Under the share system of tenancy, which in its simplest form entitles the landlord to half the produce, an improved agricultural practice becomes unprofitable unless the benefit from the improved practice exceeds twice the cost of this practice.

The numbers of owner and tenant-cultivated fields under *tattu-maru* are given in column 5 of Table 11.

TABLE 10.—Frequencies and Yields of Well-drained and Swampy Kumburas

District	*Agricultural Instructors Range*	*Well-Drained Kumburas*		*Swampy Kumburas*	
		Frequency (per cent)	*Mean Yield (bushels per acre)*	*Frequency (per Cent.)*	*Mean yield (bushels per acre)*
Kandy	Yatinuwara	92	27	8	32
	Harispattuwa	95	29	5	31
	Dumbara	89	30	11	35
	Pata Hewaheta	82	41	18	39
	Uda Bulatgama	47	30	53	25
	District Total	81	31	19	32
Kegalla	Galboda-Kinigoda	89	30	11	35
	Paranakuru	97	26	3	37
	Beligal	97	24	3	12
	Lower Bulatgama	42	20	58	23
	District Total	82	25	18	27
Ratnapura	Kuruwita	76	19	24	17
	Nawadun	45	20	55	22
	District Total	61	20	39	20
	Total for whole area surveyed	77·5	27·0	22·5	28·0

TABLE 11.—Classification of Kumburas according to System of Tenure

District	*Agricultural Instructors Range*	*Numbers of Kumburas*			
		Cultivated by owners	*Cultivated by tenants*	*Under* tattu-maru (*Owner and tenant cultivated*)	*Owner cultivated and not under* tattu-maru
Kandy	Yatinuwara	16	21	1	16
	Harispattuwa	25	13	—	25
	Dumbara	20	18	—	20
	Pata-Hewaheta	17	21	—	17
	Uda Bulatgama	12	26	—	12
Kegalla	Galboda-Kinigoda	21	11	6	21
	Paranakuru	16	11	10	7
	Beligal	10	28	—	10
	Lower Bulatgama	24	9	5	19
Ratnapura	Kuruwita	6	21	11	6
	Nawadun	10	25	3	9

When fragmentation of holdings reaches its physical limit, the system of *tattu-maru*, which involves a rotation of ownership and often of tenancy, comes into operation. The insecurity of tenure implicit in *tattu-maru* discourages the permanent improvement of holdings, the use of fertilisers that leave residual benefits and the ownership of any but the most inexpensive of implements. That both the systems of share tenancy and of the *tattu-maru* seriously obstruct the adoption of improved methods is evident. The numbers of owner-cultivated fields unencumbered by *tattu-maru* are given in column 6 of Table 11. Figures in this column may suggest that yields tend to rise with increase in the percentage of owner-cultivated fields; the coefficient of correlation of stratum yields with numbers of owner-cultivated fields is, however, only + 0.5, and is non-significant.

Visual Estimates of Yield.—The deviations of visual estimates of the yield of the standing crop made by Agricultural Instructors participating in the survey, from the objective figures provided by crop cuts are set out in Table 12. The total unsatisfactoriness of these subjective estimates is evident. The data illustrate a marked bias to under-estimation. Under-estimations of below 50 per cent. occur in the instance of one-fourth of the number of fields. The differences in efficiency between observers are striking and significant. The observer in the Lower Bulatgama range achieved exceptional precision. At the other extreme, under-estimations of below 30 per cent. occurred in 95 per cent. of the visual estimates made in the Pata-Hewaheta Korale.

Suggestions for future Surveys.—Surveys should continue over a series of years if an estimate of normal yield is to be secured. It is not unusual to base estimates of normal yields on quinquennial averages. In Ceylon, with its marked annual variations in rainfall, decennial averages should be preferred. Moving averages correct for progressive trends in cultural and fertilizer practices, but are possible only if crop cutting becomes as established routine.

TABLE 12.—Deviations of Visual Estimates from Survey Estimates

Deviation of Visual Estimate from Survey Estimate	*Numbers of Kumburas in Agricultural Instructors' Ranges*											
	Yatinuwara	*Harispattuwa*	*Dumbara*	*Pata Hewaheta*	*Uda Bulathgama*	*Galboda-Kinigoda*	*Paranakuru*	*Beligal*	*Lower Bulathgama*	*Kuruwita*	*Nawadun*	*Total*
Per cent.												
< 90	—	—	—	—	—	—	—	—	—	—	—	—
— 89 to — 70	—	—	—	14	—	1	3	—	—	2	—	20
— 69 to — 50	2	9	11	17	4	4	22	3	1	8	—	81
— 49 to — 30	15	13	16	5	10	5	3	3	8	11	8	97
— 29 to — 10	15	9	7	—	9	4	5	8	7	6	9	79
— 9 to + 10	4	1	3	—	5	11	3	9	7	6	8	57
+ 11 to + 30	—	2	—	1	3	5	—	7	5	3	6	32
+ 31 to + 50	—	3	1	—	1	1	1	1	8	1	3	20
+ 51 to + 70	—	—	—	1	2	2	—	2	1	—	2	10
+ 71 to + 90	—	1	—	—	2	1	—	2	—	—	1	7
> 90	1	—	—	—	1	4	—	3	1	1	1	12

The product of the normal yield and the condition factor provides an estimate of the mean yield in any season. The condition factor, which may be measured as a percentage, or may, as in India, follow an anna valuation, attempts assessing seasonal effects. The factor is usually determined subjectively, and possesses little precision, but unless crop-cutting experiments are conducted annually, no alternative to its use is possible.

In the islandwide surveys envisaged, at least two modifications in the design adopted in the present pilot survey appear desirable, viz. (*a*) the use of a larger plot—1/80 acre should be a suitable size—and (*b*) the use of a variable sampling fraction. Large plots reduce the bias to overestimation. The use of plots of the magnitude suggested will, however, make changes in technique necessary; it will, for instance, become necessary to thresh, winnow and weigh *in situ*. A variable sampling fraction should contribute to accuracy, particularly in this country where paddy tracts vary so much in structure and size.

SUMMARY

A random-sample survey of paddy yields in the Kandy, Kegalla and Ratnapura Districts, was conducted in the *Yala* season, 1949. The survey covered a total extent of 48,652 acres of cultivated paddy, The mean yield for the whole extent, weighted for acreage, was 27 bushels of paddy per acre. This figure was subject to a standard error of $2\frac{1}{2}$ per cent., *i.e.*, the true acre yield of the area surveyed lay between $25\frac{1}{2}$ bushels and $28\frac{1}{2}$ bushels.

The Kandy and Kegalla Districts had mean yields of 30 and 27 bushels per acre respectively. That fraction of the Ratnapura District included in the survey had a mean yield of 20 bushels per acre.

ACKNOWLEDGMENTS

I thank Mr. D. Rhind, Director of Agriculture, under whose direction this survey was conducted, and without whose assistance and advice, this survey would not have been possible. I am deeply indebted to Dr. V. G. Panse, Director, Institute of Plant Industry, Indore, and Mr. V. B. Sahasrabuddhe for help with the statistical analysis of the results. I am grateful to Mr. K. Williams, Director of Census and Statistics, for the selection of the random holdings included in the survey, and to Mr. M. L. C. Ilangakoon, Agricultural Officer, Central Division, and the Agricultural Instructors who participated in the survey, for their enthusiastic co-operation.

APPENDIX I

INSTRUCTIONS TO AGRICULTURAL INSTRUCTORS PARTICIPATING IN THE PADDY SURVEY ON THE PROCEDURE FOR DEMARCATING AND HARVESTING A RANDOM PLOT IN EACH KUMBURA

1. Do not permit harvesting of the rest of the Kumbura by the cultivators till your random plot is cut. The Kumbura should be drained as completely dry as possible before cutting.

2. Proceed to the selected Kumbura on the day fixed for cutting, preferably in the morning.

3. Stand at the South-West corner (previously fixed by a peg), with your face towards the North-West corner of the kumbura: The South-West and North-West corners are designated S. W. and N. W.

4. Select the first pair of random numbers in cage eight of copy of Schedule A relating to the holding in question: For instance, for kumbura No. 329, the first pair of random numbers is 106, 13.

5. Walk 106 steps from the corner South-West, along the line South-West to North-west. Then turn in at right angles and walk 13 steps due East. Call the point you end at, X. Walking should be confined to the bunds.

6. The point, X fixes the liyadde in which a plot measuring 6′ × 18′ is to be harvested: the liyadde to be selected is the one on the northern side of X.

7. Standing at point X, throw a peg in a northerly direction (*i.e.*, parallel to line, South-West to North-West) so that it alights within the bunds of the selected liyadde. Call the point at which the peg alights Y. This point, Y will be the North-West corner of your plot.

8. Fix PEG ONE, at the point Y. Tie a string at ground level to PEG ONE, and stretch it parallel to the length of the liyadde, and fix PEG TWO at a point 18 ft. from PEG ONE. Fix PEG THREE South of PEG ONE, at a distance of 6 ft. from PEG ONE on the perpendicular to the line connecting PEG ONE & PEG TWO, by stretching a string 19 ft. long between PEG THREE and PEG TWO.

Fix PEG FOUR South of PEG TWO at a distance of 6′ from PEG TWO on the perpendicular to the line connecting PEG ONE and PEG TWO, by stretching a string 19′ long between PEG FOUR and PEG ONE.

Check the distance between PEG THREE and PEG FOUR which must be 18′.

9. If you find that the plot demarcated includes bunds, reject it, and proceed to operate on the second pair of random number in cage eight of Schedule A, and so on, till a bundless plot is finally obtained. Underline in Schedule A, the pair of random numbers finally used.

10. Place a label carrying the *number of the kumbura* and your signature, in one of the cloth bags provided.

11. Pick the earheads within the plot with as little stalk as possible and deposit them in the bag. *Avoid the temptation to stretch the string and to include extra plants.* If a clump is more than half inside the plot, include it. If a clump is only half, or less than half inside the plot, reject it.

12. Ensure that no grain is lost by shattering. Bending the earhead into the bag before it is cut will prevent loss by shattering.

13. Sew the mouth of the bag and post it on the day of harvesting itself to the Manager, Botanist's Station, Katugastota. Post Schedule A perfected and signed to the Manager, Botanist's Station, Katugastota, on the same day.

(Sgd.) M. F. Chandraratna,
Botanist and Senior Agricultural Research Officer.

Peradeniya.

SCHEDULE A

Estimation of Yield of Paddy

1. Agricultural Instructor : ————.

2. District : ————.

3. Korale : ————.

4. Village Headman's Division : ————.

5. Village : ————.

6. Holding : { Number : ————.
Name : ————.
Extent : ————.

7. Length of Holding in Steps : ————.
Breadth of Holding in Steps : ————.

8. Pairs of Random Numbers for Selection of Liyadde : ————.

9. Length of Selected Liyadde in Steps : ————.
Breadth of Selected Liyadde in Steps : ————.

10. Variety : (If pure-line give Index No.) : ————.

11. Age : (Sowing-to-harvesting) : ————.

12. Sowing date : ————.

13. Broadcast or transplanted : ————.

14. Seed Rate : ————bushels per acre.

15. Eye estimate of yield of unhusked paddy per acre : ————bushels.

16. Date fixed for harvesting : ————.

17. Soil : (*a*) Type (heavy or light) : ————.
(*b*) Drainage (well-drained or swampy) : ————.

18. Cultivated or fallow last maha : ————.

19. (*a*) Irrigated or rain-fed : ————.
(*b*) If irrigated, source of irrigation : ————.

20. Manuring in current season :—
(*a*) Kind : ————.
(*b*) Rate per acre : ————.

21. Method of preparation of land (Ploughed, buffalo-mudded or mamotied. If ploughed, type of plough) :—

22. Weeding : (Whether weeded at all ; if weeded, state frequency and comment on standard of weed control) : ————.

23. System of Tenure : ————.

24. Remarks on factors affecting yield (e.g., damage by cattle) : ————.

25. Actual date and time of harvesting : ————.

26. Weather conditions : ————.

————

Signature of Agricultural Instructor.

APPENDIX II.

The following table supplied by the Director, Department of Meteorology, gives the deviations of the rainfall in the season of the survey, viz., *yala*, 1949, from the normal. Plus and minus signs indicate excesses and deficits respectively.

District	*May*	*June*	*July*	*August*	*September*
Kandy District	— (0″ to 5″)	— (0 to 2″)	+ (2″ to 5″)	+ (0″ to 2″)	—(0″ to 2″)
Ratnapura District East	— (0″ to 5″)	— (0″ to 2″)	+ (2″ to 5″)	+ (0″ to 10″)	— (2″ to 5″)
Ratnapura District West	0	+ (0″ to 2″)	+ (5″ to 10″)	+ (10″ to 20″)	— (2″ to 10″)
Kegalla District	+ (0″ to 5″)	+ (0″ to 5″)	+ (2″ to 10″)	+ (5″ to 15″)	— (2″ to 5″)

A Method of Treating Cotton Seed for Seed-drill Sowing

BY

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This note presents the results of investigations into the methods of treating cotton seed for sowing by tractor-drawn seed drills. The methods in use in other countries were first tried. The use of sulphuric acid was not altogether satisfactory, the cost of acid, its transport over long distances and handling were practical difficulties in its use. Daubing a paste of dung and mud, as done in India did not give the desired results. Seed and drills of Massey Harris, Canadian Cockshut, and similar types are in use, and frequent clogging of the tubes occurred with dung and mud-treated seeds.

The use of starch, however, proved very satisfactory. The method is cheap, efficient and simple to adopt. One pound of wheat flour in two gallons of water is sufficient for twenty pounds of cotton seed. The wheat flour is first seived and is then mixed with half a gallon of water. The paste thus obtained is gradually poured into one and a half gallons of boiling water and well stirred with a flat wooden ladle. The container is then taken off the fire and the gruel is then poured into a wide shallow vessel and left to cool for about half an hour. The cotton seed can then be added to the starch, up to a quantity which is not too much for effective smearing. This has been found to be about twenty pounds for two gallons of starch solution. It is necessary to knead softly while the seed is being added. The seed is then spread on jute hessian and rubbed together gently with a circular motion. This evens out the starch smear and separates individual seeds. The seed is next well spread out to dry on a drying floor, care being taken to separate the seeds. The process from daubing to drying should be done as quickly as possible. Four women will take fifteen minutes with thirty pounds of seed.

Drying must be thorough and should be repeated over three days or more. It would be wise to choose bright weather and confine daubling to mornings only so that the rest of the day is available for drying. Starch-treated seed should be well stored in damp-proof containers, and should be sown without undue delay.

Seed treated with starch between September 22 and 25, 1949, were tested for germination 21 days later, and a second test was made 42 days after starching. The results of the germination tests are given in tables I and II

Table I.—Germination Test on Cotton Seed, three weeks after starching. (Figures indicate the number of seeds that sprout each day from a total of 50 seeds in each sample)

Date of Sprouting	*Starched Seed*				*Unstarched Seed (Control)*			
	Sample 1	*Sample 2*	*Sample 3*	*Sample 4*	*Sample 1*	*Sample 2*	*Sample 3*	*Sample 4*
14.10.49	—	—	—	—	—	—	—	—
15.10.49	38	39	36	14	—	—	—	—
16.10.49	5	5	9	25	38	39	38	38
17.10.49	2	1	1	2	6	2	2	4
18.10.49	1	1	2	—	5	—	2	—
19.10.49	—	—	—	—	—	—	—	—
	46	46	48	41	49	41	42	42

Germination percentage :—90.5 per cent. 87 per cent.

Table II.—Germination Test on Cotton Seed, six weeks after starching. (Figures indicate the number of seeds that sprout each day from a total of 50 seeds in each sample)

Date of Sprouting	*Starched Seed*				*Unstarched Seed (Control)*			
	Sample 1	*Sample 2*	*Sample 3*	*Sample 4*	*Sample 1*	*Sample 2*	*Sample 3*	*Sample 4*
5.11.49	—	—	—	—	—	—	—	—
6.11.49	36	37	40	43	—	—	—	—
7.11.49	4	2	—	2	38	43	38	38
8.11.49	—	2	—	—	2	2	—	2
9.11.49	—	2	—	—	—	—	1	—
10.11.49	—	—	—	—	—	—	—	—
	40	43	40	45	40	45	39	40

Germination percentage :—84 per cent. 82 per cent.

Germination was slightly better in starch-treated seed, and commenced one day earlier.

ACKNOWLEDGMENTS

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Desert & Fringe Reclamation

BY

R. MACLAGAN GORRIE, D.Sc.

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1. Vast areas of land with a rainfall of 3 inches to 15 inches in the Punjab-Sind-Rajputana-Baluchistan block of country are showing increasing signs of aridity, and this aridity is also showing definite signs of spreading and extending into lands previously considered safe from desert influences.

2. During the last 75 years, since first the Punjab was confronted with a fuel famine for railway engines then burning wood, and the foresters established Chhanga Manga irrigated plantation to meet this shortage, the forest department has built up a body of experience in desert fringe reclamation which is parallel with but goes further than orthodox agricultural methods. Tree crops of sorts can be maintained indefinitely on subsoil moisture in many tracts with a high water level, but they must have some sort of irrigation during the first two or three seasons. From afforestation experiments in the arid low hills of Campbellpur district we know of a number of tree species suitable for use in desert fringe shelter belts. We also know that where no timber trees will persist owing to drought or physiological water shortage, many shrubs and some cane grasses can be used as shelter belts and wind breaks. We also knew that if flood water is available it can be made use of over a much greater area than can be dealt with by orthodox field husbandry by what in America is called " water spreading ", the primitive technique of the Navajo Red Indians of New Mexico and Arizona having been greatly improved under the Roosevelt conservation programme. In the Punjab we have applied the Chhanga Manga technique to a variety of sites, soils and irrigation conditions, and having in many places failed to grow timber trees we can confidently undertake to produce efficient shelter belts.

3. Whether any of this desert fringe is now producing any farm crops, or worth while grazing, or nothing at all, it is all probable in terms of —

(*a*) establishing a better water regime,
(*b*) stopping movement of shifting sand,
(*c*) establishing a more permanent and better livelihood for present occupants,
(*d*) absorbing fresh settlement of demobilised men,
(*e*) exerting a modifying influence on climate, run-off, and flood conditions both upon the areas treated and upon neighbouring districts in which increasing aridity is already evident.

4. The success of any such reclamation depends entirely upon the water regime. We must therefore start by surveying each administrative or geographical unit (say each tahsil of the Punjab) and breaking it up into one or other of the following groups: —

(i) Land already under regular irrigation, either from perennial or inundation canals, or from wells.
(ii) Land regularly subject to flooding along riverain tracts.

(iii) Land not at present receiving flood water but which could be incorporated in a water spreading project, by using waste from the tails of existing canals or by leading flood water further along prepared channels than it normally goes of its own accord.

(iv) Land which is not included in any of the above but which has an underground water table level sufficiently near the surface to justify pumping and redistribution by surface channels, or afforestation.

(v) Land which has no accessible water table and which is entirely dependent upon its own scanty rainfall.

5. All the above groups except No. 1 can have their water regime improved enormously by means of water catching and spreading. We must capitalise by catching every available drop of moisture whether emanating from rivers, subsoil storage or rainfall, and by getting as much as possible of all these redistributed in order to build up the field moisture capacity of every acre of arid land.

6. Having prepared a rough survey and classification of the land on these lines we have next to undertake a colossal amount of earth working, and this falls under the main heads of (*a*) terracing, (*b*) water spreading, (*c*) working the surface soil to make and keep it more absorptive, (*d*) subsoiling.

7. Terracing. This consists of a mound of earth aligned along the contour and planned to run across country in very wide sweeps. The alignment must be particularly accurate on flat ground where advantage must be taken of very small differences of level. Borrow pits or borrow furrows should be on the uphill side of every terrace because silting action will in time fill these pits up with good soil. On land with up to a 3 per cent. slope, one good terrace every 200 feet apart measured down the prevailing slope should be ample, the actual cross section of the terrace depending upon the labour and machinery available. With hand labour a steep-sided compact bank with a narrow base is cheapest but with the bullock-drawn " karah " or scoop preliminary ploughing is needed to loosen the soil and a broader based and lower cross section is desirable. With mechanised equipment the limiting factor is the maximum angle at which the bulldozer or road grader ploughblade can be set away from the horizontal but generally speaking a much broader base, upto say 30 or 40 ft. in width is probably cheapest and easiest.

8. Spaced at every 200 feet this gives us roughly 200 lineal feet of terrace for each acre of ground worked over. The typical road-grader or bulldozer can complete 3,000 lineal feet of such terracing in a 10-hour working day so machine power at the rate of one machine day per 15 acres is needed. Failing any supply of machinery the amount of man power required is no more than has already been used on the older canal projects, but it would require a special organization to recruit and handle the manual labour which in the absence of machinery would be about 150 man days per acre. In the scattered and often migrant grazier communities of the desert fringe it would hardly be possible to carry out any such project without a large camp for imported labour with all its obligations in the way of food rationing, control of epidemics, &c.

9. Water spreading. In the arid south-western states of Arizona and New Mexico the Federal soil conservation service has perfected various local techniques for the canalisation of torrent run off or accumulated flood water and its redistribution by means of sills, sluice gates, and distributary channels. The object is to turn the water out into fields or compartments where the water can be absorbed into the soil. It is of course only feasible where the main water channel is relatively flat enough to admit of partial penning back by a sill, or diversion by means of herring bone deflection spurs built in the main bed while that

is still dry. Such diversion is the flat land equivalent of the trapping of hill torrents as attempted in Bihar forest areas by Messrs. Owden and Warren, the object of this being to trap water from the bed of a hill torrent and lead it as far as possible round the hillside to encourage seepage. The amount of work and cost involved for flat land water spreading is about the same as for contour trenching, but the pattern is different in that the height and strength of each barrier or conduit decreases with the dispersal of the water, the ultimate field or seepage block being dug with shallow trenches to facilitate flow in the same way as is done in the Punjab irrigated forest plantation technique.

10. Surface soil working. Surface soil working is really complementary to both the above heads and is an essential phase in all types of water conservation. In the case of the typical desert fringe the light surface soil, though powdery when dry, quickly develops colloidal characters when wet and the surface after floodwater has spread and partially evaporated becomes puddled and resistant to further seepage. It is therefore essential to have periodic soil mulching done either by hand or preferably with a multiple harrow pulled by a mechanical tractor. To get the best results in terms of percolation through the surface soil it is desirable to have mulching done after every flood or heavy rain when the soil has dried out sufficiently to render soil working easy and effective. The exact time can best be determined for each locality by trial, but the local cultivators will already have their views based on experience. The number of years over which mulching will be needed depends upon the ultimate use to which the improved land is to be put. Long continued water spreading without establishing a crop or tree cover is likely to produce an excess of sodium clay in the top crust, a condition known as " thur " in the Punjab.

11. Subsoiling. A further and much more fundamental operation in soil working is the use of the subsoiler, the value of which is becoming increasingly apparent in many parts of the world cursed with scarcity of water. The subsoil plough consists of an ordinary compact heavy plough shoe fixed at the bottom of a vertical draw bar. It is forced into the ground and drawn through so that the shoe fractures the subsoil at a depth of about 1½ to 2 feet below the surface, but without turning over the sod. This operation renders the subsoil layer capable of storing many more inches of rainfall, but obviously requires a high power tractor. It is hardly conceivable that any ordinary bullock plough team, even in multiple drought, could work it. The value of this tool in dry zone agriculture is already accepted and it is in use in several farms in India. It is claimed that the extra water storage in the subsoil after subsoiling has vastly improved the prospects of dry zone farming both in the yield and choice of crops which can be produced. For our purposes of desert fringe reclamation the subsoiler obviously opens up a new era of hope and activity, because with its use we can get practically the whole of the rainfall into the soil where previously only a fraction of it percolated in and the rest went straight off to the sea.

12. The ideal way to use the subsoiler would be after the main pattern of terrace bunds has been laid out and built, to run the subsoiler through at 8 or 10 feet intervals, keeping its furrows roughly parallel with the main bund. The cost of this will depend to a great extent on the condition and geological composition of the subsoil but an average for desert fringe land with a rubbly but loose layer of kankar amongst the sands and clays of alluvial deposits is likely to be about one machine day of 10 hours for every 20 acres with a 10-feet spacing. Tractor operating costs show this to be about Rs. 4 per acre, but only about half of this is fuel oil and hired labour.

13. The tractor salesmen's literature indicates that subsoiling deeply is likely to injure rather than help cereal crops where the available moisture is deficient, but this is presumably only a short term effect which will be smoothed out over a series of years,

particularly when a better water regime is being established and the chances of building up a better field moisture capacity are improving. This factor of deep subsoiling may however influence our allocation of land as between farm crops and purely conservation measures. To start with, at any rate, we must keep a high percentage of the reclaimed ground under trees and grass.

14. Allocation of land uses in reclaimed areas.

Having established the best possible system of water catching it now remains to make the best use of the ground in terms of introducing the most suitable permanent dry farming, afforestation and shelter belt practice. The choice of crop will naturally depend upon the behaviour of the water in the soil. For cereal straw crops a good field capacity at the 2 to 4 feet level is essential, but gram amongst winter crops and many of the monsoon millets can of course be produced with much less, and cane grass and small trees with less again. Whatever is given out for ordinary cultivation should be on a definite understanding of safeguards:—*e.g.*, no browsing animals whatever; ploughing to be along the contour; mulching as per best local practice; maintenance of terrace bunds and sluices; acceptable rotation of crops to be prescribed; maintenance of whatever shelter belts have been established on neighbouring terrace bunds.

15. The remainder of the ground must be under shelter belts with a choice of:—

(*a*) afforestation, and
(*b*) grass production.

In any case grazing must be under very strict control. Afforestation need not necessarily be with timber trees and much of the desert fringe in its present condition simply will not produce them. We can however do a great deal with the giant cane grasses (*Saccharum munja* and *Saccharum spontaneum*) which have previously been treated as weeds in the Punjab. Where the contour terrace bunds are at right angles to the prevailing wind these should be heavily stocked as wind breaks. Where the contour terrace system falls parallel to the prevailing wind then a separate series of wind breaks of grass, trees and bushes must be established, preferably on a system of low bunds at right angles to the wind. The ideal form of shelter belt to break the force of the desiccating summer west wind is probably an outer and lower fringe of agaves, then cane grass and shrubs leading up to higher trees in the rear.

16. The use in Uganda of similar coarse grasses grown as a 3 or 4 year fallow is a recent innovation, the importance of which has not yet been appreciated in India either in silviculture or agriculture. Any coarse cane grass will serve the purpose, as they all produce a very large bulk of cane, leaves and roots from a minimum of moisture. It serves a two-fold purpose; firstly by covering the fallow land with a mat of vegetation it reduces surface sheetwash to a minimum, and secondly it provides a mass of vegetable matter which when ploughed under, helps to build up a far better tilth, particularly where sheet erosion has already swept away the top soil and left only a clay or kankar subsoil exposed.

17. Where *Saccharum munja* is at all prolific, as it may readily become under the improved water regime of our proposals, its roots are so big as to present a real problem to the individual cultivator with only his bullocks and a light plough and even after burning the grass tops. The answer is again in mechanised equipment, but the cultivator can only secure its aid either through collective farming, or if government continues to provide the necessary machines and trained staff over a period of years for the proper maintenance of all these conservation items.

18. The potential value of grass as a means not only of preventing soil erosion but of actively building up a better tilth is summarised clearly in the newly published Imperial Agriculture Bureaux Joint Publication No. 6—Alternate Husbandry. From this it would appear that under arid conditions a fairly long "ley" under grass should be followed by a fairly long period under ordinary crops, because the first crop after grass in arid land may be disappointing and the gain is likely to be shown only by subsequent crops which profit by the gradual breaking down in the soil of the grass roots and stems. I suggest that 4 years under cane grass followed by 4 years of other crops should be given widespread trials under all the various combinations of soil and moisture presented by the desert fringe country. We also must learn how far we can eliminate burning which at present is the cultivators' method of exterminating cane grass from any ground he is preparing as a seed bed. The roots are often so massive as to be obstacles even to a heavy mechanised plough, and will in any case take years to rot down unless pulverised before being ploughed under.

2 —J. N. A 99084 (7/50)

Rice Production in Australia *

ALTHOUGH the area under rice cultivation in Australia is very small, and total production a mere drop in the bucket of world production, many overseas experts consider that rice growing in Australia is a small model of perfection. Yield per acre is higher than anywhere else in the world—the average yield has been as high as 2.23 tons of paddy per acre and averages about 1.89 tons at the present time. In 1947-48 the area under cultivation was nearly 26,000 acres. The actual area used for rice at one time or another is considerably more than this, but it is not general practice to use the same land in successive years for rice, although yields have not decreased appreciably on land that has produced its 4th and 5th crop.

The rice growing area in Australia is almost confined to the Murrumbidgee Irrigation Area in New South Wales, near the Victorian border. Water for irrigation is not plentiful in Australia and rainfall is extremely low in parts. It is considered that successful rice cultivation in Australia is dependent upon sufficiently high temperatures during the growing period, freedom from extreme hot-to-cold changes, a dependable water supply during the growing period, soils that are comparatively flat or level and overlying an impervious subsoil, satisfactory surface drainage, freedom from water weeds and the application of nitrogenous fertilisers. Average size of holding would be about 500 acres and the limitation of acreage imposed by the Rice Marketing Board keeps down individual plot of rice in any one season to 60—100 acres each.

First step in establishing an Australian rice farm is to make a close contour survey of the land. Substantial check banks are then built to hold irrigation water to a depth of 6 to 10 inches. Check banks in Australia are rather different from the somewhat neater and more compact ones seen in other parts of the world. As in all phases of rice production, the making of the banks is by mechanical means. Frequently a heavy single furrow plough is used with a tractor, striking parallel furrows 7 to 9 feet apart. Loose soils from the ploughing is then moved in slightly with a reversible extension steel delver. Ploughing and delving alternate until sufficient soil has been pushed inwards to create a bank high enough above the general ground level. Some banks are as wide as 14 feet at the base. This practice might appear wasteful, but growers consider they are handsomely repaid by the knowledge that nothing is likely to go wrong with the banks during the growing period. Furthermore they are sufficiently wide and solid to allow the farmer to drive sheep along them so that weeds can be kept down by cropping.

The land itself is then ploughed and cultivated by multiple disc plough and harrows drawn by tractors. The whole operation is similar to that used in the type of power farming practised by Australian wheatgrowers. The size of bays is largely governed by the contour of the land, and though on some flat properties very large bays can be made, a convenient size has been fixed as 4 to 6 acres.

The high yield of rice per acre in Australia is due partly to efficient use of mechanization and partly to the high quality of seed used. Caloro 11 (mid-season) and Late Caloro have been evolved and found satisfactory. At the Leeton Experiment Farm

* Furnished by the office of the High Commissioner for Australia in Ceylon.

several crossbreds have been fixed which combined the yielding ability of Caloro with greater straw strength and grain quality. In normal seasons, Caloro rice produces heads that are well filled, with very few empty spikelets, fairly dense, of medium length, curve, having typically 9 to 12 nodes, each bearing at least one primary branch, and some of the lower nodes two branches.

On the Murrumbidgee Irrigation Area it is usual to sow from about the middle of September until the end of October—roughly the first half of Spring. Graded seed is used at the rate of 100 to 150 lb. per acre according to the variety, type of soil, method of sowing, the number of crops taken of the land, and the particular stage of the sowing period. Method generally adopted is to sow the seed at a shallow depth as if it were wheat or oats, the ordinary wheat drill or combine being used, and the seeds being covered by the soil in the usual way. Horses are used for ploughing in some farms, but tractors are more usual.

Good results are obtained by the use of sulphate of ammonia at the rate of 2 cwt. per acre. Artificial fertilisers are usually applied to the land either through the manure box of the seed drill or combine at the time of sowing the seed (so that the whole operation is completed at the one time) or else it is applied by broadcasting the fertiliser in the rice bays subsequent to the germination of the rice. Then again, some growers like to drill in part of their fertiliser while seeding, and to broadcast the remainder in the water at an early stage of the plants' growth. Land is then flooded and drained. When the farmer considers that maximum germination has been achieved, the rice seedings and weed growths are totally submerged to a depth of a few inches above the plant and the water is gradually raised as the rice plants grow until the full depth of water to be held on the bays has been reached.

Over a period of years excellent results have been obtained in the control of certain weeds when early sown rice fields have become badly infested during the seedling stage. Method is to drain the water from the rice fields when the weather has become warm, and stocking very heavily with sheep to eat off all plant growth as quickly as possible. Immediately this is done, bays are filled again to full capacity. While this treatment definitely delays the maturity of the rice and is not always recommended, it otherwise affects the rice plant very little if carried out quickly. Most of the weed fails to grow through any depth of water and soon dies.

The fall between check banks is usually about 2 inches. This method is considered to minimize the number of banks needed and to make watering less laborious, as the water is more easily controlled. It can readily be led from one bay to another, thus gradually refreshing the water practically throughout the growing period, which is very necessary, particularly if decomposing vegetation of any description is likely to cause the water to become slimy or somewhat stagnant.

Australian ricegrowers have found that, to obtain the heaviest yields and best quality rice, it is necessary to keep water on the plot until the last few grains towards the base of the heads are out of the milk stage and in the full dough stage, and the panicles of the varieties now used are well turned down. They are in no hurry to drain of the water and sometimes take a few days over the actual operation.

During a highly favourable season, harvesting has begun towards the end of March, but it is more usual to strip crops during April, May and June. Here again mechanization is the rule. Harvesting of rice in Australia is often carried out by a tractor drawing a side-cut, auxiliary driven headers which has an 8 feet to 12 feet cut. They cut, thresh, winnow and clean the paddy in the one operation. They are fitted with large grain boxes

and bagging platforms that enable the grain to be bagged while the machine is actually on the move. Every now and then the machine stops and the filled bags are put down on to the ground.

Though Australian manufacturers of agricultural machinery now make some implements specifically for the rice grower, the header used for harvesting is fundamentally the same as that used by wheat farmers, with a little adaption. Mechanization has made rice growing possible in Australia. By its aid, 81 men are able to harvest 8,000 tons of rice in two months from the huge farm at Wakool. Some use has been made of fore-cut auto headers on crawler tractors. Few if any, ricegrowers cut with a binder and stock the sheaves.

The estimated loss in dressing rice (from the paddy to the uncleaned state) is from 16 to 20 per cent. of the weight of the rice; the proportion of cleaned and polished commercial rice to paddy ranges from ½ to ⅔. Approximate milling out-turn per 100 lb. of paddy is:—

60.5 lb.	...	...	commercial rice
3.7 lb.	...	...	polish
17.3 lb.	...	...	bran
18.5 lb.	...	...	hulls

As soon as crops are harvested, the Rice Marketing Board takes possession of all marketable paddy and disposes of it to the best advantage. The Board was established in 1928 when growers realised that co-operation was necessary if their industry was to survive, so entire control of rice marketing is vested in the Board made up of growers' nominees and two Government representatives.

Conditions may change later, but at present there seems little prospect that rice growing in Australia will develop to anything remotely approaching the acreage in other countries. Shortage of water and shortage of suitable land are among the reasons. Meanwhile Australia continues to lead the world in the advanced use of mechanization in rice cultivation and in the yield of paddy per acre.

PROCEEDINGS OF THE FIFTH MEETING OF THE CENTRAL BOARD OF AGRICULTURE HELD AT THE C.B.A. HALL, BOTANIC GARDENS, PERADENIYA, ON APRIL 3, 1950, AT 2 P.M.

Mr. D. Rhind, Director of Agriculture, presided and the following were present:—Senator C. Wijesinghe; Mr. Chas. A. M. de Silva; Senator (Col.) T. Y. Wright; Mr. W. P. A. Wickramasinghe, M.P.; Mr. S. A. I. Elapata; Mr. S. L. Bandara Dharmakirti; Mr. A. W. R. Perera, Assistant Commissioner, Development of Marketing; Mr. E. Abeyratne, Agricultural Research Officer, Maha Illuppalama; Dr. M. F. Chandraratne, Botanist and Senior Agricultural Research Officer; Mr. W. A. Guthrie, Deputy Director of Irrigation; Dr. W. R. C. Paul, Principal, School of Agriculture; Mr. F. C. Cooke, Director, Coconut Research Scheme; Dr. E. Phillis, Director, Rubber Research Scheme; Mr. R. H. Spencer Schrader; Hon. Mr. H. W. Amarasuriya, Minister of Commerce and Trade; Major E. C. de Fonseka, M.B.E., E.D.; Sir James P. Obeysekera; Mr. R. T. Chelliah; Gate Mudaliyar N. Wickremaratne; Mudaliyar N. M. Abulcassim Maraikar; Mr. A. Perumynar; Mr. R. B. Thalakada, (Assistant Registrar, Co-operative Societies, representing the R.C.S.); Mr. A. M. Clement Dias; Rev. Fr. L. W. Wickremasinghe; Mr. W. M. Cumaraswamy; Mr. A. Hensman; Mr. S. Sivapalan, M.P.; Mr. A. L. Johnpulle, Divisional Agricultural Officer, Uva; Gate Mudaliyar M. S. Kariapper, M.P.; and Mr. H. E. S. Ranasinghe, C.C.S., Secretary, Central Board of Agriculture.

The following visitors were also present:—Mr. P. G. Malkani, (Acting Deputy Director, Veterinary).

Letters and telegrams regretting inability to attend the meeting were received from the following members:—

Mr. R. Singleton Salmon; T. B. Poholiyadde Dissawe; Mr. S. C. Fernando, Registrar of Co-operative Societies; Conservator of Forests; P. B. Bulankulame Dissawa; Mr. K. W. Devanayagam; Mr. E. Muttukumaru; Mr. U. B. Unamboowe; Mr. Marcus S. Rockwood; Mr. P. B. Tennekoon, D.R.O., Anuradhapura; Director, Tea Research Institute; Dissawa A. E. Madawela.

I. CONFIRMATION OF THE MINUTES OF THE LAST MEETING

The minutes of the previous meeting, copies of which had been circulated among all the members, were unanimously confirmed as correct.

II. RECOMMENDATIONS OF THE SPECIAL COMMITTEE APPOINTED BY THE BOARD

The next item on the agenda was to consider the recommendations of the Special Committee appointed by the Board to examine the set-up of the Department dealing with the paddy aspect of agricultural activities and see whether any improvements could be effected.

The Chairman in presenting the recommendations contained in the minutes of the Special Committee meeting of the Board, copies of which had already been circulated among the members, said that any re-organization of a Government Department must necessarily originate from the Minister in charge of the Department. It is not possible for this Board to set up Committees to re-organize the Department. The most they can do is to recommend to the Minister that some such re-organization is necessary and leave it to the Minister

to implement that recommendation or not. He said he mentioned it because the original resolution was to re-organize the set-up of the Department. The resolution of the Special Committee read as follows:—

> "In view of the rèsumè given by the Director of Agriculture and the members of the Committee, particularly in regard to rice, it is felt that what is being done now is just a beginning in a very small scale and there is a colossal task ahead of us. As such it is agreed that an intensive campaign be set on foot immediately with a large increased staff, better co-ordination and greater efficiency to make the country as quickly as possible, self-sufficient."

At this stage Gate Mudaliyar N. Wickremaratne inquired whether that resolution was going to be discussed or whether it was going to be put to the house for approval.

The Chairman replied that it was open to the house either for approval or rejection.

Hon. Mr. H. W. Amarasuriya said that in view of the recommendation of the Special Committee the Board was of opinion that no change in the set-up of the Department was necessary. The point at issue was whether a change was necessary and if so what that change should be. Therefore he moved the following resolution:—"That in view of the report of the Special Committee submitted to the Central Board of Agriculture, no change is necessary in the set-up of the Department of Agriculture for the present."

Mr. Spencer Schrader seconded.

Gate Mudaliyar N. Wickremaratne said that he withdrew his original resolution on the suggestion of the Hon. Mr. Amarasuriya that a Special Committee be appointed to examine the present set-up of the Department, which could make specific proposals to be submitted to the Minister. He said he did not agree with the resolution of the Special Committee because there was no use passing such resolutions because such resolutions had been passed many a time by this Board. As such he did not wish to associate himself with the resolution or the recommendation of the Special Committee.

Dr. E. Phillis, Director, Rubber Research Scheme, said that he had learnt by experience that the lines on which the Department of Agriculture was now working were the correct lines. No amount of work put in by any department could get results unless the people themselves were ready to take an interest in what a department was doing for this country and until the people themselves were ready always to make the best of it by sheer hard work, no efforts would have any permanent effects. What is wanted is an educational campaign with demonstrations which could help them. The Department was doing its best in these matters and he was of opinion that it was working on correct lines and almost the only lines which would bring success.

Senator Wijesinghe said that although he was perfectly satisfied with the progress that is being made in the Department he would like to know whether the Board could not make any change in the set up or the organization even for the achievement of progress.

The Chairman said that, speaking for his Minister, if he thought that any change in the set-up of the Department would help, it would be made quickly. But he thought that at the moment the Minister agreed that the Department was getting along and beginning to make an impression, though admittedly it was only a beginning. As Dr. Phillis had said, demonstrations and education of farmers were the only effective means of getting results.

The motion was put to the house and 24 were in favour with one member abstaining.

III. ACTION ON RESOLUTIONS PASSED AT THE LAST MEETING

Two letters from the Ministry concerning resolutions passed by the Board were tabled. The first resolution was on the subject of Increasing Food Production, and the reply from the Ministry was to the effect that the Departments concerned were being consulted on the proposals made and that a further reply would be sent shortly. The second was a resolution in appreciation of the work done by the Land Commissioner, and the reply was a letter of thanks to the Board for the generous sentiments expressed on the excellent work done by the Land Commissioner. The same letter stated that action was being taken to have two other resolutions passed by the Board, implemented.

IV. RESOLUTIONS TO BE MOVED

Mr. A. M. Clement Dias suggested that Major de Fonseka's resolution should be taken up first as that was a resolution which was postponed from the last meeting due to the mover being absent.

At this stage Major E. C. de Fonseka stated that he was not going to move the resolution in his name and that he would like to withdraw it.

Item (*d*) of the Agenda was taken up next.

Mr. Chas. A. M. de Silva formally moved the following resolution:—" That the Board resolves to insert the following rule after rule 5 of the C.B.A. rules, namely—The Chairman shall have the right to accept or reject any resolutions submitted to be placed on the Agenda."

Mr. de Silva said that those who find their time useful would agree with him that sometimes a great deal of time was wasted on wordy battles and useless resolutions. Many resolutions which had been placed before the Board had to be postponed for want of time. Most of the time was wasted on proposing resolutions which were useless, except perhaps to the mover and some of the suggestions on such resolutions could be implemented by themselves without moving resolutions at the Board. In moving his resolution, he also mentioned that such a rule existed before 1944 and that such a rule still exists in District Agricultural Committees and the Chairman could approve of a resolution or disapprove. This Board being the main body, he felt that such a privilege should be extended to the Chairman of this Board to use his discretion in placing resolutions which are sent to the Secretary, before this Board. He then read Rule No. 5 of the Board, namely—" Thirty days at least before the date of a meeting of the Board, the Secretary shall post a notice of the meeting to each member of the Board. Notice of any subjects that a member may desire to be placed on the agenda of any meeting shall reach the Secretary ten days at least before the date appointed for the meeting." He suggested that the following words should be added to the above rule:—" The Chairman shall have the right to accept or reject any resolutions submitted to be placed on the agenda." He concluded hoping that members would support his resolution.

Senator (Col.) T. Y. Wright seconded this resolution and read out a similar rule that existed in the Senate.

Mr. Spencer Schrader also supported this resolution and stated that at the first meeting of the Board, a few months ago, a resolution came up that the meetings of the Board should be held once in two months instead of once in three months. This resolution did not even find a seconder and was defeated. He was surprised that a resolution to the same effect crops up again. He therefore felt that once a resolution is defeated, there should be a time limit within which it could not be brought up again before the Board, and supported Mr. de Silva's resolution that the Chairman should have the power either to accept or reject a resolution that was sent up to be placed on the agenda.

Gate Mudaliyar Wickremaratne objected to this resolution being moved and said that there was no necessity for such a resolution. This Board had been in existence from 1935 and before that, from 1905 there was the Board of Agriculture in which the Chairman always had the privilege to reject a resolution if he thought it unsuitable. He remarked that he had cause to believe that this resolution was to fulfil certain political objects of the mover. He said that this Board does not want politics. Regarding Mr. de Silva's remarks that certain discussions of resolutions were a waste of time, Gate Mudaliyar Wickremaratne emphasized that it was not merely the resolution that helped the Minister and the others but it was the discussion of various points and expression of various opinions that helped them. Although such a rule existed many years back, rules are changing as we progress. Therefore introducing it again would mean our trying to go backwards. Since we are in a democratic country and since we are assembled here as ordinary members, we should not have those restrictions. We are not bound to follow these regulations and rules for nothing and even the proposal to limit the time for each speaker was not at all to the advantage of the Board. Therefore he concluded by reiterating his objection to including this resolution to the rules of the Board, as the Chairman always had the right either to accept or reject a resolution that came up to be placed on the agenda.

Hon. Mr. H. W. Amarasuriya said he would suggest a *via media* to the resolution before the house and the objection raised by Gate Mudaliyar Wickremaratne. He agreed with Gate Mudaliyar Wickremaratne that since they were all in a democratic country, they would like to move their resolutions unhampered. He therefore proposed that once a resolution is moved in the Board that it could not be brought up again before the expiration of six months or some such time limit. He said that Mr. Spencer Schrader had just given an instance of a resolution that was taken up a few months ago, coming up before the Board, again. He therefore believed that his proposition would meet both points of view. He also added that the Chairman has been very courteous to members and any resolution sent up has been promptly placed on the agenda.

Mr. W. M. Cumaraswamy seconded this proposition.

Mr. C. A. M. de Silva inquired whether it was an amendment to his resolution or whether it was a new resolution. He added that if it were an amendment to his resolution he would agree provided that all resolutions were scrutinized by the Chairman or the Secretary.

Hon. Mr. H. W. Amarasuriya said that he would not like to embarrass the Chairman by controversial discussions on the point. He has only suggested a *via media* and not a new resolution.

Senator Wijesinghe said that although for his personal convenience he would like such a resolution, he felt that it was very undemocratic to implement it and would not be in the interests of the people or the country to include it in the statute book of the Board. He suggested that if the Chairman was allowed to exercise his right to reject a resolution from the agenda, the mover should be allowed to bring it up at the end of the meeting under " Any other Business ".

Mr. W. P. A. Wickremasinghe felt that if a resolution was rejected from the agenda, it was not fit to be brought up at all, not even at the end of the meeting.

Mr. C. A. M. de Silva's motion was put to the house and defeated, 8 voting for, and 14 against.

At this stage Mr. R. T. Chelliah requested that members of the Board should be afforded an opportunity of seeing the Gal Oya Development area.

Gate Mudaliyar M. S. Kariapper supported the proposal that members of the Board should visit the Gal Oya scheme and that the next meeting of the Board should be held at Gal Oya. If the members agreed to have the next meeting at Gal Oya, Gate Mudaliyar Kariapper said he would be glad to invite all of them for lunch.

The next item on the agenda was for Gate Mudaliyar Wickremaratne to initiate a discussion on " How best individual planters and estate owners could contribute to the prevention of Soil Erosion and assist in the conservation of water in their respective areas."

The Chairman said that the subject was a very big one and he personally would like to have a full discussion on it in the presence of the Soil Conservation expert. He said that the Soil Conservation expert had arrived in the Island a few days before last Christmas and had been very busy acquainting himself with the soil erosion and conservation problems of the Island, and had naturally been unable to cover the whole Island. In view of the fact that the Expert was busy on some very urgent soil conservation problems in the Gal Oya catchment area, he had thought it unwise to call him to that meeting. That survey would occupy him for about another six weeks. He therefore suggested that the resolution be taken up at the next meeting.

Gate Mudaliyar Wickremaratne inquired whether the Chairman had ruled it out.

The Chairman replied that he had only expressed an opinion.

Gate Mudaliyar Wickremaratne then agreed that it would be more advantageous if it was discussed in the presence of the Expert and postponed his discussion with the permission of the House.

At this stage Hon. Mr. H. W. Amarasuriya suggested that it would be helpful, if in the meantime, the Gate Mudaliyar could prepare a paper on the subject, to be taken up at the next discussion of the subject.

Gate Mudaliyar Wickremaratne agreed to prepare a paper on the subject and send it to the Chairman within two weeks.

Gate Mudaliyar Wickremaratne's next resolution was, " That the passages beginning with the words—' Asked for the indulgence and only gained credence through frequent repetition ' be deleted from the minutes of the meeting held in August, 1949—appearing on page 3 of the printed minutes."

When Gate Mudaliyar was about to move this resolution, Mr. C. A. M. de Silva rising to a point of order, pointed out to the Chairman that a member could not be allowed to move a resolution to alter the minutes of a meeting which had already been confirmed by the Board.

The Chairman agreed that once the minutes were confirmed by the Board they could not be altered.

Gate Mudaliyar Wickremaratne inquired how a member was allowed to speak on the minutes of a meeting, at a previous occasion and that he brought this resolution as suggested by the Chairman at the previous meeting.

Mr. Spencer Schrader said that he did not discuss the minutes but the discussion was on matters arising out of the minutes, and furthermore there was no resolution to amend the minutes as such.

A majority of the members felt that that resolution was out of order, and the Chairman ruled it out.

The next resolution to be moved by Gate Mudaliyar Wickremaratne was, " That this Board is of opinion that the Director of the Coconut Research Scheme is not justified in making his statement:—' The majority of Superintendents did not even trouble to collect the crop. Instead the same patch of manioc was shown year after year to the visiting food crop inspectors and thus the object of the order was defeated,' bringing certain reflections on the duties of persons mentioned therein and request the Director to withdraw these remarks unless he can justify."

Hon. Mr. Amarasuriya suggested that the Director, Coconut Research Scheme, should be asked to explain before the resolution was moved, so that if he could justify that statement, it would not be necessary to move the resolution.

The Chairman replied that he had no right to ask the Director, Coconut Research Scheme, to explain before the resolution was moved.

At this stage Gate Mudaliyar Wickremaratne said that he was not going to move any more resolutions that day or take any further part in that day's proceedings and declined to move two more resolutions standing in his name on the agenda.

Major E. C. de Fonseka, with the permission of the house withdrew his resolution, " That early steps be taken by Government to establish a Milk Marketing Board." Although he was to move this resolution at the last meeting, it could not be taken up. In the meanwhile he had learnt that the Minister of Health and Local Government had appointed a Committee consisting of officials to go into the recommendations made by an earlier Committee. The report of that Committee was referred to as the Milk Report, and one of its recommendations was that a Milk Marketing Board should be established. On a visit to Bombay in December last, he had the opportunity of going round several farms and discussing with the Milk Commissioner in Bombay as to how he had set about the production and distribution of milk in that city. The Milk Commissioner is responsible for the production and distribution of milk throughout the city and he is assisted by a Milk Marketing Board. He had therefore come to the conclusion that appointing a Board before a Commissioner was like putting the cart before the horse and felt that no useful purpose would be served by that resolution. He therefore proposed to move at the next meeting a resolution calling upon the Government to appoint a Milk Commissioner.

The two resolutions on the agenda to be moved by A. E. Madawala Dissawa were treated as lapsed in the absence of the mover.

On the proposals put forward by two members that the Board should be afforded an opportunity of visiting the Gal Oya Scheme, the Chairman invited the opinion of the Board. The Chairman added that in case the next meeting was held at Gal Oya, it was not possible to go through a big agenda except perhaps to confirm the minutes, as much time would be required to see the Scheme.

Gate Mudaliyar Kariapper suggested that the Board could meet at Inginiyagala and proceed to the Gal Oya Scheme, and extended an invitation to the whole Board for lunch. He also requested the Chairman to inform him of the definite date of the meeting and the number of members who would be present.

It was then agreed that the next meeting be considered as a Special Meeting which would be held at Gal Oya on a date to be fixed by the end of May, and that the Chairman should circularize all members.

V. ANY OTHER BUSINESS

Hon. Mr. H. W. Amarasuriya suggested that after every meeting of the Board, the Chairman should give a rèsumè of all resolutions which have been implemented by Government, and this was agreed to.

The meeting terminated at 3.15 p.m.

H. E. S. Ranasinghe,
Secretary,
Central Board of Agriculture.

April 7, 1950.

RUBBER RESEARCH SCHEME (CEYLON)

MINUTES OF THE ONE HUNDRETH MEETING OF THE RUBBER RESEARCH BOARD HELD AT THE PLANTERS' ASSOCIATION HEADQUARTERS, COLOMBO, AT 10 A.M. ON SATURDAY, MAY 20, 1950

Present.—Mr. D. Rhind, O.B.E., (Director of Agriculture) in the Chair, Dr. E. Phillis, Ph.D., D.Sc., (Director, R.R.S.), Mr. T. D. Perera, C.C.S. (Deputy Secretary to the Treasury), Mr. F. H. Griffth, M.P., Mr. R. J. Hartley, Mr. F. A. Obeyesekera and Mr. J. L. D. Peiris.

An apology for absence was received from Major M. Jayewickrema, M.P.

1. MINUTES

(*a*) *Signing.*—Draft minutes of the meeting held on March 24, 1950, which had been circulated to members, were signed by the Chairman on signification of members' assent that they were in order.

(*b*) *Matters arising from the minutes.*—

Chairman of the Board.—The Chairman reported that the proposal that he should continue to continue to function as Chairman of the Board had not received the approval of the Minister of Agriculture and Lands. It was therefore necessary that a new Chairman should be elected. Mr. F. H. Griffith, M.P., was unanimously elected Chairman with effect from June 1, 1950.

2. BOARD

A letter from Senator C. Wijesinghe stating that he would be away from the Island for about six weeks was read and it was agreed that he be given leave of absence from meetings during this period.

3. EXCHANGE OF CLONES WITH R.R.I., MALAYA

It was reported that the Rubber Research Institute of Malaya had agreed to the principle of exchange of planting material between the two institutions; also that the Government of Malaya had removed the ban on the export of rubber planting material. The release of budwood of the R. R. I. M. 500 series, on the terms already agreed on, was authorised.

4. REPORTS AND ACCOUNTS

(*a*) *Annual Report for 1949.*—This was considered and approved. In the Oidium Research Officer's report the results of investigations regarding the manner in which Oidium is carried over from one season to another were noted with interest. It was also noted that one resistant clone (LCB. 870) had been found and that the mechanism of resistance had been traced; the latter might assist in indicating resistant clones at a very early stage.

(*b*) *Director's report for the 4th quarter 1949*—was approved.

(*c*) *Estate accounts for December 1949 and January 1950*—were tabled.

(*d*) *Investments.*—Reported that a sum of Rs. 250,000 had been invested in 3 per cent. Sri Lanka Loan 1969/74.

5. **STAFF**

(*a*) *Botanist.*—Reported that Mr. C. A. de Silva, Botanist, had been granted a month's sick leave from May 8.

(*b*) *Junior Staff.*—Changes in staff were reported.

Before the meeting ended Mr. Obeyesekera expressed the deep sense of appreciation of the unfailing courtesy and goodwill extended to members by the retiring Chairman. The Chairman thanked Mr. Obeyesekera for the sentiments expressed and assured the Board of his continued interest in the affairs of the Scheme.

Research Laboratories,
Dartonfield, Agalawatta, June 3, 1950.

C. D. DE FONSEKA,
Secretary Accountant.

MINUTES OF MEETING OF THE BOARD OF THE TEA RESEACH INSTITUTE OF CEYLON HELD ON APRIL 1, 1950, AT 9.30 A.M. AT THE OFFICES OF THE PLANTERS' ASSOCIATION OF CEYLON, 113, STEUART PLACE, COLPETTY, COLOMBO.

Present.—Mr. R. C. Scott, C.B.E. (Chairman): The Secretary to the Treasury (Mr. C. E. Jones, C.M.G., C.C.S.); The Chairman, Planters' Association of Ceylon (Mr. E. G. Groves); The Chairman, Agency Section, Planters' Association of Ceylon (Mr. G. K. Newton); Messrs. H. de T. Wilkinson Kay, J. C. Kelly, R. Singleton-Salmon, W. Neal de Alwis, J.P., U.M., Leo B. de Mel, J.P., U.M., Errol Jayawickrama, V. G. W. Ratnayake, M.P., W. L. Ross, E. N. Ewart and J. Lamb (Acting Director and Secretary).

Mr. G. B. Portsmouth, Plant Physiologist, was present by invitation.

A letter from the Director of Agriculture (Mr. D. Rhind) expressing his inability to be present was tabled.

2. MEMBERSHIP

(*a*) *Board.*—

The Chairman reported that:—

(i) Mr. G. K. Newton, on assuming the Chairmanship of the Agency Section of the Planters' Association of Ceylon from Mr. R. J. Hartley, became an ex-officio Member of the Board as from December 31, 1949.

(ii) Mr. J. C. Kelly was nominated by the Agency Section of the Planters' Association of Ceylon to fill the vacancy created by the departure of Mr. W. H. Attfield on furlough with effect from March 31, 1950.

(iii) Mr. H. S. Hurst, who had proceeded on leave and had now returned to the Island, would resume his seat replacing Mr. W. L. Ross who had been acting for him.

(*b*) *Experimental Sub-Committee.*—

The Chairman said that Mr. Hurst would resume his place on this Committee. Mr. S. Bolster had been acting for him.

The Chairman thanked all outgoing members for the useful services they had rendered to the Board during their tenure of office and extended a cordial welcome to the new members.

3. VISITING AGENT'S REPORT

The Chairman said that copies of this report had been circulated to Members, and pointed out it had not yet been discussed by the Estate and Experimental sub-Committee. It was proposed to hold a Meeting of this Committee in the very near future. It will be noted that the appointment of the Field Assistant as approved at the last Meeting of the Board has been made.

4. BLISTER BLIGHT

The Chairman said he was glad to be able to inform members that the Amendments to the Tea Control Act has passed both Houses and was on the Order Book of the House of

Representatives for April 4. This meant that the release of Rs. 150,000 for work in connection with large-scale experiments to combat this disease was assured. Mr. Lamb was then asked to give an account of developments in Blister Blight control work, and reported as follows:—

(i) *Programme of Work.*—This followed the lines indicated in the report to the Tea Controller, copies of which had been issued to all members of the Board.

(*a*) *200-acre Spraying Experiment.*—With the kind co-operation of the Consolidated Tea Estates Company Limited, an area of 200 acres of Kataboola Estate, Kotmale, had been made available for spraying experiments during the South-West monsoon. The site was most suitable because it offered a variety of problems and a relatively very high incidence of blister blight.

(*b*) It was essential that this experiment should be closely supervised. Messrs. George Steuart & Co. have been unable to supply an S.D. and the Colombo Commercial Co. had very kindly agreed to loan one of their S. Ds., Mr. N. M. Lindsay, for six months. Mr. Lindsay was a Graduate in Agriculture, Aberdeen University, and had also attended a one-year post-graduate course in agriculture. Mr. Lindsay would reside on Kataboola Estate and work as a member of the Superintendent's staff.

(*c*) An experiment on purely agricultural methods as distinct from spraying methods of control had also been laid out on Kataboola Estate and would also be supervised by Mr. Lindsay.

(ii) Apart from the Kataboola experiment, eight other estates covering the Ramboda, Nuwara Eliya and Agrapatna districts had agreed to carry out 50-acre spraying experiments during the South-West monsoon. These experiments were to be carried out at the expense of the estates concerned. The Institute's commitments were:—

(1) To train the labourers required for the spray gang. Lines were being built on St. Coombs to accommodate these labourers for the training period.

(2) To arrange for a two-or three-day course of instruction for the Superintendents of these estates.

(3) To order the necessary equipment and to endeavour to obtain it free of import duty.

(iii) *Work on St. Coombs.*—This would fall under two main headlings:—

(*a*) *Development of Spray Equipment.*—Mr. James Landreth had been appointed to the staff as Engineer. Mr. Landreth had sailed for the United Kingdom on short leave and would

(1) order the equipment necessary for the Workshop.

(2) visit Plant Protection, Pest Control, Shell Company's Research and Development Department in Holland, the Engineering Department of Long Ashton Research Station, and various manufacturers of spraying machinery.

(*b*) *Tests with fungicidal preparations.*—A large-scale experiment was being planned to test the effect of long term application of copper fungicides, both with respect to quality and spray residue. Dr. Swarbrick of the Research and Development Department of the

Shell Organisation had arranged to send a Plant Pathologist to work at St. Coombs for six months. This Pathologist, Dr. Pfaeltzer, was expected to arrive in Ceylon within the next few days. Arrangements were being made to test some 150 fungicidal prepartions, including all those that had been offered for sale as proprietary preparations in the world market and a number of coded formulations developed in the Shell Company's laboratories. A field assistant from the Passara Sub-Station had been transferred to St. Coombs to assist Dr. Pfaeltzer. The most successful of these 150 compounds would later be tested on a larger scale, possibly in plots of about 50 acres in extent.

(iv) Finally, Mr. Lamb referred appreciatively to the help given by Agency Houses, Engineering Firms and Estates in planning the Blister Blight Control work. Every request made by the Institute for assistance had been granted.

The Chairman said he wished to endorse the remarks made about the excellent co-operation the Institute had received from the Minister of Agriculture and Lands, the Agency Houses, the Consolidated Estates Co., Ltd., the Engineering Firms and everyone else concerned.

Referring to the importation of equipment and other material needed for these experiments, he said that it was most important that these should be allowed free of duty and also that they be released with the least possible delay. He proposed that the Board of the Tea Research Institute requests the Honourable the Minister of Finance to consider the desirability of allowing *all* spraying machinery, equipment and accessories, together with fungicides, to be used against the blister blight disease of tea into the Island free of duty and without delay.

5. SENIOR STAFF

The Chairman said that Dr. F. Haworth had accepted the post of Agricultural Chemist. He was at present on six month's leave in the United Kingdom but was prepared to curtail his leave if necessary. It was expected he would arrive in Ceylon in July or August. Arrangements had been made for Dr. Haworth to spend some time at East Malling Research Station to learn the technique for investigation of minor element status of plants.

6. JUNIOR STAFF

Small Holdings Officer, Southern Province.—It was reported that following the approval of all members Mr. M. V. de Silva has been appointed Small Holdings Officer, Southern Province.

J. LAMB,
Acting Secretary.

Tea Research Institute of Ceylon,
St. Coombs, Talawakelle, May 22, 1950.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED APRIL 30, 1950

Province	Disease	Fresh cases during the month	Cases up to date since Jan. 1, 1950	From Jan. 1, 1950, to April 30, 1950			
				Deaths	Recoveries	No. shot	Balance Ill
Western Province	Foot-and-mouth	10	51	—	51	—	—
	Rabies	1	1	1	—	—	—
Colombo Municipality	Foot-and-mouth	36	430	—	394	—	36
	Anthrax	2	2	2	—	—	—
	Rabies	9	35	35	—	—	—
	Piroplasmosis	1	4	4	—	—	—
	Tuberculosis	—	1	1	—	—	—
	Mange	1	2	—	1	—	1
Quarantine Station	Anthrax (in goats and sheep)	—	41	41	—	—	—
Northern Province	Foot-and-mouth	—	912	7	883	—	22
	Rabies	—	6	—	—	6	—
North-Central Province	Foot-and-mouth	130	130	—	—	—	130
North-Western Province	Foot-and-mouth	—	8	6	2	—	—
	Rabies	—	4	1	—	3	—
Central Province	Mange (cattle)	56	424	3	322	—	99
	Foot-and-mouth	2	156	1	153	—	2
	Piroplasmosis	—	1	—	1	—	—
Sabaragamuwa Province	Rabies	1	10	5	—	5	—
	Foot-and-mouth	15	15	—	13	—	2
Uva Province	Rabies	—	1	—	—	1	—
Eastern Province	Foot-and-mouth	125	125	2	12	—	111
	Rabies	—	1	—	—	1	—
	Surra	—	69	69	—	—	—
Southern Province	Foot-and-mouth	—	19	—	19	—	—
	Rabies	—	1	—	—	1	—

Peradeniya, May 29, 1950.

T. M. Z. MAHAMOOTH,
Deputy Director (Animal Husbandry),
and Government Veterinary Surgeon.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED MAY 31, 1950

Province	Disease	Fresh cases during the month	Cases up to date since Jan. 1, 1950	From Jan. 1, 1950, to May 31, 1950			
				Deaths	Recoveries	No. Shot	Balance Ill
Western Province	Rabies	—	1	1	—	—	—
	Foot-and-mouth	14	65	—	59	—	6
Colombo Municipality	Foot-and-mouth	—	430	—	430	—	—
	Anthrax	2	4	4	—	—	—
	Rabies	2	37	37	—	—	—
	Piroplasmosis	—	4	4	—	—	—
	Tuberculosis	—	2	2	—	—	—
	Mange	—	2	—	2	—	—
Quarantine Station	Anthrax in (sheep and goats)	—	41	41	—	—	—
Northern Province	Rabies	2	8	—	—	8	—
	Foot-and-mouth	74	986	7	945	—	34
North-Central Province	Foot-and-mouth	691	821	—	—	—	821
North-Western Province	Rabies	—	4	1	—	3	—
	Foot-and-mouth	36	44	6	4	—	34
Central Province	Mange (Cattle)	49	473	3	375	—	95
	Foot-and-mouth	—	156	1	—	—	155
	Piroplasmosis	—	1	—	1	—	—
Sabaragamuwa Province	Rabies	1	11	5	—	6	—
	Foot-and-mouth	—	15	—	15	—	—
Uva Province	Rabies	—	1	—	—	1	—
Eastern Province	Foot-and-mouth	238	363	56	249	—	58
	Rabies	—	1	—	—	1	—
	Surra	—	69	69	—	—	—
Southern Province	Foot-and-mouth	—	19	—	19	—	—
	Rabies	—	1	—	—	1	—

T. M. Z. MAHAMOOTH,
Deputy Director (Animal Husbandry) and Government Veterinary Surgeon.

Peradeniya, July 3, 1950.

3——J. N. A 99084 (7/50)

METEOROLOGICAL REPORT, APRIL, 1950

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Offset	Mean Minimum	Offset	Day	Night (from Minimum)		Amount	No. of Rainy Days	Offset
	°	°	°	°	%	%		Ins.		Ins.
Agalawatta	89·4	+0·4	73·0	—0·4	80	95	5·2	11·40	16	— 1·99
Anuradhapura	93·2	+1·7	73·2	—1·3	63	93	5·0	1·42	8	— 5·01
Badulla	84·4	+0·3	64·8	—1·4	69	94	5·0	1·96	13	— 5·04
Batticaloa	87·0	—0·9	76·2	—0·5	77	93	4·2	2·61	6	+ 0·31
Colombo	87·9	0	76·1	+0·2	76	93	5·8	4·61	13	— 4·46
Diyatalawa	78·0	+0·3	58·9	—1·7	71	88	5·5	3·15	14	— 3·39
Galle	86·1	0	76·6	—0·1	78	91	6·0	10·25	15	+ 1·54
Hakgala	—	—	—	—	—	—	—	2.56	12	— 4·42
Hambantota	88·2	+0·5	76·4	+0·1	75	88	5·5	1·81	10	— 2·05
Jaffna	90·0	+0·5	80·0	—0·2	72	85	6·2	0·45	4	— 1·78
Kandy	88·6	+0·3	69·3	—0·7	68	95	5·4	5·40	13	— 1·09
Kurunegala	90·6	—0·5	74·2	—0·5	67	90	5·2	6·89	9	— 3·02
Mannar	89·8	—0·5	78·1	+0·1	73	86	5·2	1·21	4	— 2·21
Nuwara Eliya	71·2	—0·1	47·3	—2·6	—	—	5·0	3·80	12	— 1·18
Puttalam	88·5	—0·7	75·6	—0·5	74	91	5·0	4·73	8	— 0·15
Ratmalana	88·1	—	75·2	—	73	91	6·0	5·13	13	— 5·44
Ratnapura	91·4	+0·3	73·6	—0·2	74	93	4·2	7·65	16	— 3·92
Talawakele	77·6	0	56·2	—1·6	67	82	4·0	2·85	9	— 3·45
Trincomalee	88·8	—0.4	78·0	+0·4	73	86	4·6	1·05	4	— 1·08

WEATHER SUMMARY—APRIL, 1950

Rainfall in April was mainly below average, excesses being generally confined to the extreme south of the Island and to small isolated areas in the west, centre and east. The larger deficits—distributed over the central and western parts of the Island—included 9.06 inches at Dunedin Estate and 8.86 inches at Kitulgala, while the largest excesses were 8.19 inches at Dandeniya, 6.60 inches at Hiyare and 6.49 inches at Labuduwa. The larger totals were found in the southern and south-western regions, the highest being 16.24 inches at Labuduwa and 16.17 inches at Hiyare. The greater part of the north and east recorded less than 2 inches for the month. Six daily falls of over 5 inches were recorded, the highest being 6.58 inches at Embilipitiya on the 4th.

There were several spells of wet weather, mainly the result by thunderstorm activity, from 2nd to 10th, 18th to 25th, and from 28th onwards.

A hailstorm was experienced at Diyatalawa on the afternoon of the 13th, and another at Talatu Oya on the 29th.

Temperatures were about normal by day and below normal by night. The highest recorded shade temperatures were 97.2° at Anuradhapura on the 19th and 20th, and 97.1° at Trincomalee on the 30th, while the lowest temperature in the low-country was 64.6° at Anuradhapura on the 1st. The lowest temperature for the whole Island was 39.7° at Nuwara Eliya on the 27th.

Day humidity was about 75% near the coast and about 70% or less inland. Night humidity was generally over 90%. Cloud amounts were above average. Wind strength was about normal, the direction being variable.

D. T. E. DASSANAYAKE,
Director.

METEOROLOGICAL REPORT, MAY, 1950

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Offset	Mean Minimum	Offset	Day	Night (from Minimum)		Amount	No. of Rainy Days	Offset
	°	°	°	°	%	%		Ins.		Ins.
Agalawatta	—	—	—	—	—	—	—	—	—	—
Anuradhapura	94·2	+3·6	77·6	+1·4	60	86	6·1	2·27	6	— 1·27
Badulla	86·1	+0·7	66·2	—0·2	65	95	5·9	4·11	11	— 0·58
Batticaloa	91·6	+1·4	78·1	+0·3	69	86	6·2	0·82	6	— 0·97
Colombo	87·8	+0·8	79·7	+2·2	77	85	6·6	10·19	14	— 5·30
Diyatalawa	79·2	+0·6	61·8	—0·3	67	84	6·6	2·29	11	— 3·77
Galle	85·2	+0·2	78·9	+0·8	82	86	7·0	7·73	20	— 4·94
Hakgala	—	—	—	—	—	—	—	8·83	12	+ 0·38
Hambantota	88·6	+1·9	78·9	+1·4	76	86	6·9	2·31	8	— 1·96
Jaffna	88·8	+0·7	82·4	+0·8	78	81	7·0	0·75	4	— 1·25
Kandy	87·5	+0·4	71·5	+0·5	70	90	6·7	8·89	12	+ 1·32
Kurunegala	89·2	0	77·0	+1·0	72	86	6·2	5·08	13	— 2·47
Mannar	90·0	+0·6	81·9	+1·3	74	81	5.6	1·58	3	— 0·21
Nuwara Eliya	69·7	—0·7	52·0	—1·2	82	94	6·4	10.93	11	+ 2·46
Puttalam	88·8	+0·6	80·9	+2·1	75	82	6·1	1·42	9	— 2·35
Ratmalana	87·8	—	78·9	—	75	82	6·8	6·33	16	—10·08
Ratnapura	89·6	+0·8	75·9	+1·1	76	93	6·7	9·15	19	—11·76
Talawakele	75·0	—0·5	59·5	—0·3	80	91	6·6	9·29	14	— 0·12
Trincomalee	93·6	+1·7	78·4	—0·3	66	84	6·3	6·96	9	+ 3·73

WEATHER SUMMARY—MAY, 1950

In May again rainfall was below normal over a large portion of the Island, the bigger deficits (of the order of 10 to 15 inches) occurring in the south-western low and mid-country, where monthly totals were about half the May average. Outstanding deficits were 15.77 inches at Gikiyanakande Estate, 13.15 inches at Morawaka, 13.01 inches at Rayigam Estate, 12.83 inches at Marambekande Estate and 12.61 inches at Galatura Estate.

Excesses were generally small, and occurred among the central hills and on the north-east side of the Island, the highest being 13.41 inches at Kellie Estate, 7.03 inches at Illukkumbura, 5.90 inches at Oopar Estate and 5.48 inches at Kabaragalla Estate.

Rainfall was heaviest on the western and south-western slopes of the hills, where several stations recorded totals over 20 inches, including 35.41 inches at Kellie Estate, 28.12 inches at Carney Estate, 26.99 inches at Norton Bridge, 25.92 inches at Kenilworth Estate and 25.37 inches at Blackwater Estate. Outside the south-western parts the rainfall was generally below 5 inches. Least rain (totals below 2 inches) occurred along the north-west coast, on the south-east and in the extreme north.

There were five daily falls over five inches in May, the highest being 7.08 inches at Kellie Estate on the 26th.

There was very little rain during the first fortnight. Monsoon conditions were in evidence from about the 16th, but the accompanying rainfall was rather meagre. Due to a depression in the Bay of Bengal the weather became unsettled from 25th to 28th, resulting in fairly widespread rain with occasional thunder. Rainfall on the south-western slopes of the hills during these days was moderately heavy.

Temperatures were above normal, particularly by day. The highest temperature recorded in the shade was 99.2° at Anuradhapura on the 10th, while the lowest temperature for a low-country station was 73.0° at Batticaloa on the 26th. The lowest temperature for the whole Island was 42.8° at Nuwara Eliya on the 3rd.

Day humidity was about 75% in the south-western parts and below 70% on the east side. Night humidity was generally about 85% Skies were more cloudy than usual. Wind was above average strength, the prevailing direction being south-westerly

D. T. E. DASSANAYAKE,
Director.

METEOROLOGICAL REPORT, JUNE, 1950

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Offset	Mean Minimum	Offset	Day	Night (from Minimum)		Amount	No. of Rainy Days	Offset
	°	°	°	°	%	%		Ins.		Ins.
Agalawatta	—	—	—	—	—	—	—	—	—	—
Anuradhapura	90·1	+0·3	76·4	0	62	86	6·8	0·52	5	— 0·21
Badulla	85·9	+0·5	64·4	—1·0	60	91	5·2	0·31	2	— 1·23
Batticaloa	92·5	+0·2	77·5	—0·2	60	76	7·0	0·07	1	— 0·82
Colombo	85·2	—0·2	77·7	+0·4	80	89	7·0	6·29	15	— 2·37
Diyatalawa	77·7	+0·1	63·5	+0·3	58	74	6·2	0·07	2	— 1·89
Galle	83·1	—0·6	77·6	+0·3	84	89	6·8	4·37	10	— 4·07
Hakgala	—	—	—	—	—	—	—	—	—	—
Hambantota	87·2	+0·8	77.0	+0·2	74	86	6·8	0·81	8	— 1·30
Jaffna	86·5	—0·2	80·8	—0·1	77	82	6·8	0	—	— 0·39
Kandy	81·8	—1·6	71·1	—0·2	77	88	7·1	6·95	22	— 1·88
Kurunegala	85·4	—1·2	75·6	0	74	84	6·6	5·13	17	— 1·66
Mannar	87·2	—1·0	80·1	—0·5	77	82	7·0	0	—	— 0·36
Nuwara Eliya	64·0	—1·7	55·4	—0·3	89	91	7·4	6·38	20	— 4·05
Puttalam	85·7	—0·6	79·1	—0·1	76	84	7·0	0·56	2	— 0·84
Ratmalana	84·8	—	76·8	—	78	86	7·0	6·28	16	— 2·70
Ratnapura	87·1	+0·4	74·8	+0·1	78	93	7·3	9·58	28	— 8·97
Talawakele	68·8	—2·1	59·9	—0·5	87	91	7·4	9·21	27	— 4·07
Trincomalee	91·8	—0·4	79·4	+0·4	62	78	7·2	0	—	— 0·93

WEATHER SUMMARY—JUNE, 1950

For the fourth month in succession rainfall in June was below normal over the Island. The larger deficits occurred in the south-western area (where monthly totals were generally 5 to 10 inches below average), outstanding deficits being 15.37 inches at Watawala, 15.18 inches at Kitulgala, 14.83 inches at Ingoya Estate, 14.50 inches at Hapugastenne Group and 13.02 inches at Maliboda Estate. There were a few isolated slight excesses.

Heaviest rain occurred on the south-western slopes of the hills where several stations recorded totals over 15 inches, the highest being 29.37 inches at Theydon Bois Group, 29.26 inches at Kellie Estate, 25.55 inches at Norton Bridge, 23.55 inches at Weweltalawa Estate, and 23.35 inches at Blackwater Estate.—Outside the south-west quarter monthly totals were generally below two inches. No rain was recorded in the north and north-east of the Island, and at some stations in the south-east.

There were no daily falls over five inches in June.

The weather throughout the month was of the monsoonal type, but the rainfall experienced was generally light or moderate.

Temperatures were, on the whole, below normal. The highest recorded temperature in the shade was 96.8° at Batticaloa on the 18th, whilst the lowest temperature for a low-country station was 72.2° at Ratmalana on the 7th. The lowest temperature for the whole Island was 51.8° at Nuwara Eliya on the 15th.

Day humidity was above 75 per cent. in the south-west and about 60 per cent. on the east side. Night humidity was round about 85 per cent. Skies were more cloudy than usual. Wind was about the average strength, the prevailing direction being south-westerly.

D. T. E. DASSANAYAKE,
Director.